



United States
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Agriculture



Natural
Resources
Conservation
Service

In cooperation with
United States Department
of the Interior,
Bureau of Indian Affairs;
the Navajo Nation;
and the New Mexico and
Arizona
Agricultural Experiment
Stations

Soil Survey of Shiprock Area, Parts of San Juan County, New Mexico and Apache County, Arizona



How to Use This Soil Survey

General Soil Map

The general soil map, which is a color map, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

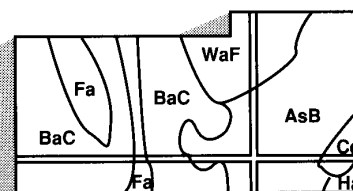
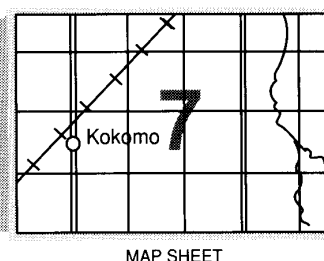
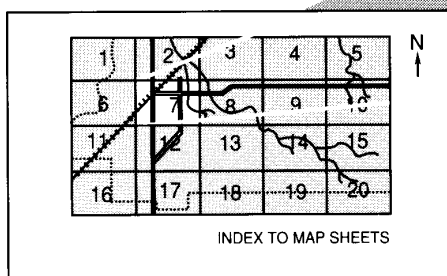
Detailed Soil Maps

The detailed soil maps can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets**. Note the number of the map sheet and turn to that sheet.

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Contents**, which lists the map units by symbol and name and shows the page where each map unit is described.

The **Contents** shows which table has data on a specific land use for each detailed soil map unit. Also see the **Contents** for sections of this publication that may address your specific needs.



NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies such as Indian tribes. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1991. Soil names and descriptions were approved in 1992. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1992. This survey was made cooperatively by the Natural Resources Conservation Service, the Bureau of Indian Affairs, the Navajo Nation, and the New Mexico and Arizona Agricultural Experiment Stations. The survey is part of the technical assistance furnished to the Shiprock Soil and Water Conservation District.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

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Cover: The Ship Rock is the most prominent landmark in northwestern New Mexico. On the skyline are the forested Chuska and Lukachukai Mountains straddling the New Mexico-Arizona state line.

Additional information about the Nation's natural resources is available on the Natural Resources Conservation Service home page on the World Wide Web. The address is <http://www.nrcs.usda.gov>

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Foreword

This soil survey contains information that can be used in land-planning programs in the Shiprock Area of the Navajo Indian Reservation. It contains predictions of soil behavior for selected land uses. The survey also highlights soil limitations, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, and agronomists can use it to evaluate the potential of the soil and the management needed for efficient food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. The information in this report is intended to identify soil properties that are used in making various land use or land treatment decisions. Statements made in this report are intended to help the land users identify and reduce the effects of soil limitations that affect various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Great differences in soil properties can occur within short distances. Some soils are subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey soils are poorly suited to use as septic tank absorption fields.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Rosendo Trevino III
State Conservationist for New Mexico
Natural Resources Conservation Service

Michael Somerville
State Conservationist for Arizona
Natural Resources Conservation Service

Soil Survey of Shiprock Area, Parts of San Juan County, New Mexico and Apache County, Arizona

By Joseph V. Chiaretti Jr., Natural Resources Conservation Service

Fieldwork by Joseph V. Chiaretti Jr., Charles D. Hibner, William R. Johnson, Tom E. McCarty, and Michael W. Roybal, Natural Resources Conservation Service

Vegetative work by Harmon S. Hodgkinson and Larry D. Ellicott, Natural Resources Conservation Service

United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with
United States Department of the Interior, Bureau of Indian Affairs; the Navajo Nation; the Shiprock Soil and Water Conservation District; and the New Mexico and Arizona Agricultural Experiment Stations.

General Nature of the Survey Area

This section gives general information concerning Shiprock Area. It briefly discusses the history and development; the physiography, geology, and geomorphology; and the climate of the survey area.

Shiprock Area, parts of San Juan County, New Mexico and Apache County, Arizona, is on the Navajo Indian Reservation in the Four Corners region of the southwestern United States (fig. 1). It encompasses approximately 1,871,543 acres, of which 1,091,113 are in northwestern New Mexico, and 780,430 are in northeastern Arizona. The survey area occupies about 2,900 square miles and is bounded on the north by the states of Colorado and Utah. The Shiprock Area includes parts of Bureau of Indian Affairs Land Management Districts 9, 12, and 13. The major community in the area is Shiprock, New Mexico. The area also includes several smaller communities and trading posts.

The survey area includes portions of the following major land resource areas (MLRA): San Juan River Valley, Mesas and Plateaus-MLRA 37; New Mexico and Arizona Plateaus and Mesas-MLRA 36; Colorado and Green River Plateaus-MLRA 35; and Arizona and New Mexico Mountains-MLRA 39 (USDA, 1981).

U.S. Highway 666 traverses the eastern portion of the survey area in New Mexico north to the Colorado state line. U.S. Highway 64 traverses the northern

portion of the area from the eastern survey boundary west to Teec Nos Pos, Arizona. U.S. Highway 160 traverses the northern portion of the survey area in Arizona from near the Four Corners Monument west to the survey boundary at Chinle Creek. U.S. Highway 191 traverses the southwestern portion of the survey area in Arizona from the Utah state line to the survey boundary near Rock Point. In addition, New Mexico Highways 371 and 134 parallel the southeastern and southern boundaries of the survey area, respectively.

The San Juan River, a major perennial stream, flows west through the northern part of the survey area in New Mexico from The Hogback to the Colorado state line near the Four Corners Monument. The Mancos River is a tributary which joins the San Juan River just before it leaves the survey area. The Chaco River forms most of the eastern survey boundary from where it enters the Navajo Reservation to where it has carved a water gap through the Hogback monocline. The Chinle Wash forms most of the northwestern survey boundary from just north of Rock Point to where it becomes a perennial stream, and has a name change, at the junction with Laguna Creek. The survey boundary continues along Chinle Creek to the Utah state line.

Other important streams of the area have their origins in the high elevations of the Chuska Mountains. Examples of these are the Captain Tom

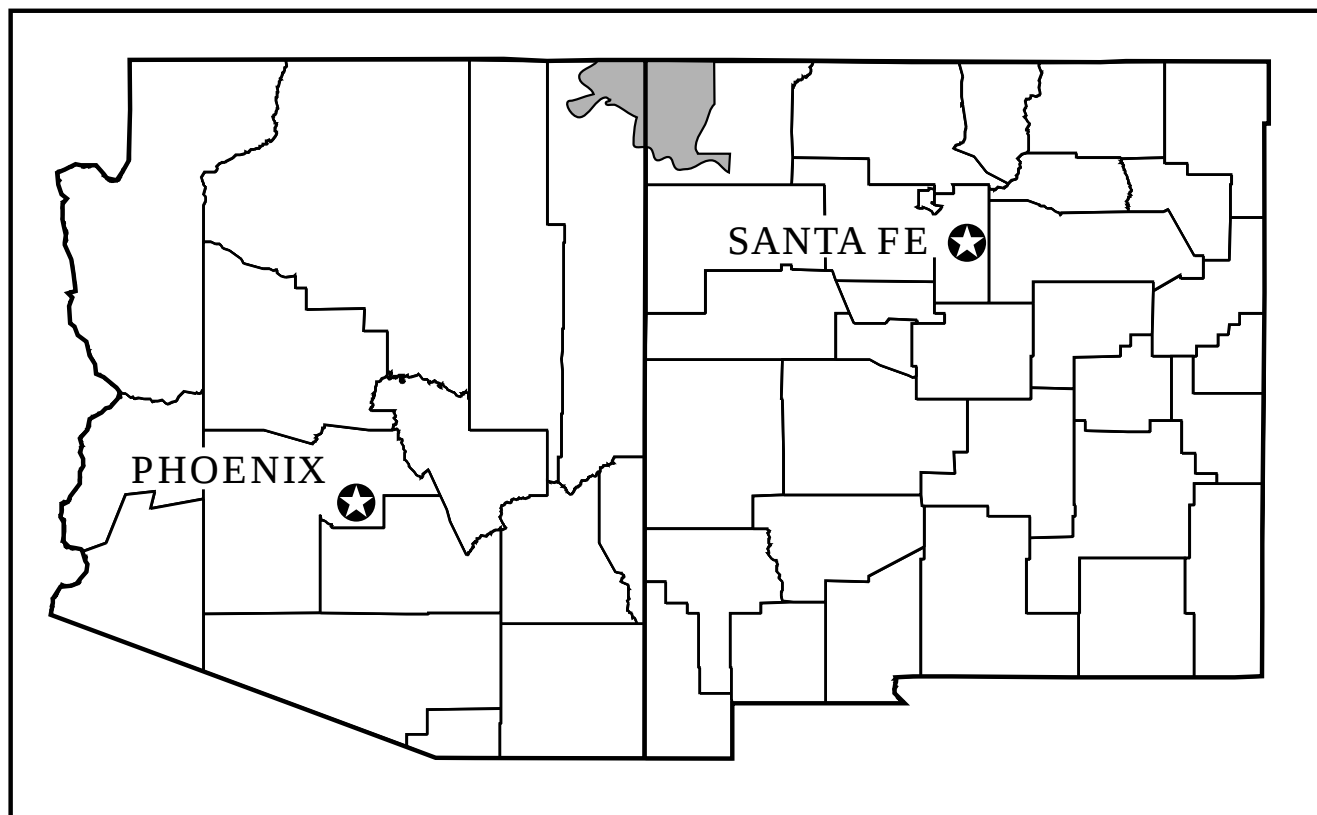


Figure 1.—Location of Shiprock Area in New Mexico and Arizona.

and Sanostee Washes, which are tributaries of the Chaco River; and Tsaille, Wheatfields, and Whiskey Creeks, which flow west into Arizona to form the Chinle Wash drainage.

Elevations range from a low of 4,610 feet where the Chinle Creek enters Utah, to a high point of 9,808 feet atop the east summit of Roof Butte in the Chuska Mountains in Arizona.

Soil scientists have determined that there are about 137 different kinds of soils in the Shiprock Area. The soils vary widely in their climate, texture, color, natural drainage, slope, and other characteristics. The soils in the eastern and western portions of the survey area are at low elevations and mostly gently to moderately sloping, but the arid and semiarid climates limit forage production for livestock grazing. Soil blowing and accelerated soil erosion resulting from deteriorated plant communities are a major problem in many parts of the survey area.

The soils in the higher elevations are in the middle portion of the survey area, and are generally steeply sloping, high in rock fragments, and/or shallow to bedrock. These soils occur in climates with enough soil moisture to foster the growth of woodland and

montane forest plant communities. If well managed, these soils can produce forage for domestic livestock and wildlife, wood products for local use, and marketable timber for well into the future.

Descriptions, names, and delineations of soils in this soil survey do not fully agree with those on soil maps for adjacent survey areas. These differences are the result of different scales of mapping, intensity of mapping, better knowledge of soils, modifications in soil series concepts, or the extent of soils within the survey area.

History and Development

Paleo-Indian and Archaic people began entering the Shiprock Area between 8,000 and 10,000 B.C. (Stuart, 1986). Human occupation of the area by Archaic hunting and gathering populations began as early as 4,000 B.C. These semi-nomadic people gradually developed an agrarian, pueblo-dwelling lifestyle and are now known as the Anasazi. The Anasazi occupation of the Shiprock region began about 700 A.D. Outlier communities of both the Chaco and Mesa Verde branches of Anasazi culture

existed in the Shiprock Area. It is believed that a combination of harsh climate, environmental problems, interclan violence, and social unrest forced the Anasazi to abandon the Four Corners region between 1100 and 1350 A.D.

Nomadic Athapaskan people began entering the American Southwest between 1200 and 1500 A.D. and gradually separated into the ancestors of modern Apache and Navajo Indians. The first settlements of early Navajo people began about 1400 in the canyon and mesa country between present-day Farmington and Chama, New Mexico. This area is known as Dinétah, or “the land of the people,” in Navajo mythology.

The Spanish entered the Southwest in the mid-1500's and encountered the Navajo people by about 1625 (Wilson, 1967). The term “Navajo” dates to this seventeenth century contact, after which the Spaniards modified a Tewa Pueblo Indian word meaning “people of the great planted fields.” Navajo culture changed rapidly, and the tribe's range expanded after contact with Pueblo Indians and upon acquiring horses and sheep from the Spanish after 1680. The early Navajo were pressured by Ute Indians into leaving their original area of settlement and migrated westward into the Chuska Mountains region by the mid-1700's.

Spanish and Mexican military expeditions into the Shiprock Area occurred intermittently between 1659 and 1846. These forays were undertaken from Santa Fe, New Mexico to capture Indians for slaves and to punish Navajos for their raids against New Mexican settlements (Wilson, 1967; University of Arizona Press, 1982). Several place names in the survey area, such as Mexican Cry Mesa and the Carrizo Mountains, are a result of these campaigns. The Southwest became a U.S. possession following the end of the Mexican-American War in 1848. Continuing armed conflicts developed between Navajos and New Mexican settlers in the years between 1849 and 1863 (Underhill, 1956). In 1864, New Mexico volunteers under the command of Colonel Kit Carson forced over 8,000 Navajo into surrender and then exile for four years at Bosque Redondo near Fort Sumner, New Mexico.

The Treaty of 1868 allowed the Navajo people to leave Bosque Redondo and return home. They were then granted a 3.5 million-acre reservation straddling the boundary between Arizona and New Mexico (Underhill, 1956). Most of the Shiprock Area lies

within the confines of this original reservation. The present reservation area is over 16 million acres and is the largest Indian reservation in the United States. Trading posts appeared on the reservation after 1875 and formed an important bridge between the Navajo and Anglo cultures. The first important geographic survey work of the Shiprock Area took place in 1874 and 1875 by artist-geologist William H. Holmes of the F.V. Hayden surveys (Crampton, 1983).

Shiprock was founded in 1903 by Indian agent William T. Shelton and derives its name from the Ship Rock, a prominent volcanic neck southwest of the town. The Navajo name for the Shiprock community is *Nataani Nez*, or, “tall chief,” referring to Shelton, a controversial man who greatly impressed the Navajo people (The Navajo Tribe, 1978). The community of Shiprock is situated adjacent to much of the Navajo reservation's mineral wealth. Employment and royalties from oil, natural gases, coal, uranium, and electric power generation have spurred the town's growth.

In Navajo mythology, the Ship Rock pinnacle was once a large eagle which rescued the Navajo people from danger, brought them to the area, and then turned into stone. Their name for it is *Tse'Bit'a'i'*, meaning “the rock with wings.” The Ship Rock is a well-known natural landmark in the Southwest, and in 1962 it was featured on the United States postage stamp that commemorated 50 years of statehood for New Mexico.

Livestock grazing on the rangeland and timber production in the Chuska and Lukachukai Mountains are the principal land uses in the Shiprock Area. Irrigated agriculture is also practiced on family farms along the San Juan River, Chinle Wash, and several smaller washes. Uranium-vanadium mines first opened in the Carrizo Mountains in 1942 and below the Lukachukai Mountains in late 1950 (Chenoweth and Malan, 1973). Significant tonnages of ore were produced from these mines until production ceased in 1968. Petroleum production currently takes place in the Hogback, Horseshoe-Gallup, Rattlesnake, Shiprock-Gallup, Tociito Dome, Weekley Canyon, Boundary Butte, and Dineh Bi Keyah oil fields.

Shiprock, New Mexico is the largest community in the survey area, with approximately 8,000 people. The total population of the survey area is approximately 27,000 people. They are concentrated around Shiprock; in the Chuska Valley between Little Water and Sheep Springs, New Mexico; along the

Chinle Wash near Rock Point, Arizona; and in the Redrock Valley straddling the New Mexico-Arizona state line.

Physiography, Geology, and Geomorphology

The Shiprock Area lies within the Navajo and Canyon Lands sections of the Colorado Plateau physiographic province (Hawley, 1986; Hunt, 1956; New Mexico Geological Society, 1982).

The survey area contains portions of seven distinct structural subsections which differ in their bedrock geology (New Mexico Geological Society, 1982; Woodward, 1973). The San Juan Basin and Four Corners Platform are in the Navajo section; and the Blanding Basin, Carrizo Dome, Red Rock Bench, Defiance Uplift, and Tyende Saddle are in the Canyon Lands section. In addition, the fluvial surfaces associated with the San Juan, Chaco, and Mancos Rivers are major components of valley portions of the San Juan Basin, Four Corners Platform, and Blanding Basin.

The *San Juan Basin* is separated from the *Four Corners Platform* by the steeply tilted monocline known locally as The Hogback. The Hogback monocline trends southwestward from where the San Juan River enters the survey area towards the community of Two Grey Hills, New Mexico. The surface geology consists of late Cretaceous sedimentary rocks deposited in marine, littoral, and deltaic environments. The western San Juan Basin is typified by exposures of the Fruitland and Menefee Formations (Cooley et al., 1969; New Mexico Geological Society, 1982; O'Sullivan and Beikman, 1963). Extensive surficial deposits of alluvium and eolian sands are east and north of the Chaco River (Schultz, 1983). The Four Corners Platform has broad expanses on the Mancos Shale and localized exposures of the Gallup Sandstone. Also present are Tertiary tuff-breccia and basalt in prominent volcanic necks and dikes such as the Ship Rock and Bennett Peak (Cooley et al., 1969; Shelton, 1966). The geomorphology of these two subsections is dominated by undulating plateaus with locally prominent buttes, mesas, cuestas, and shallow canyons. Prominent landforms such as plateau escarpments, buttes, and mesa rims are commonly bounded by vertical sandstone cliffs and intricately dissected shale badlands. A stepped sequence of high stream terraces, present above the San Juan River and its tributaries, represents abandoned Pleistocene flood plains (Shelton, 1966). Elevation

ranges from about 4,800 to 6,800 ft (1,463 to 2,073 m).

The *Blanding Basin* is bounded on the east by the Four Corners Platform, on the south by the Carrizo Dome and Red Rock Bench, and on the west by the Tyende Saddle. The surface geology consists of early Cretaceous and late Jurassic sedimentary rocks deposited in fluvial continental environments. It is typified by isolated areas of the Dakota Sandstone and variegated exposures of the four local members of the Morrison Formation (Harshbarger et al., 1957). Surficial deposits of alluvium and eolian material mantle the Morrison Formation across broad areas. These deposits occur east of Red Rock, Arizona and from near Totacon (Sweetwater community) north to the Arizona-Utah state line (Cooley et al., 1969; O'Sullivan and Beikman, 1963). Landforms include long cuestas, shallow canyons and valleys, narrow fan terraces, undulating plateaus, isolated mesas, steep hills, and some shale badlands. Elevation ranges from about 4,600 to 6,600 ft (1,402 to 2,012 m).

The *Red Rock Bench* is bounded by the Defiance Uplift on the south, the Carrizo Dome and Blanding Basin on the north and east, and by the Tyende Saddle on the west. Surface geology consists of late Triassic sedimentary rocks deposited in fluvial and arid continental environments. These red bed deposits are typified by exposures of the Chinle Formation in Redrock Valley and the Wingate Sandstone elsewhere (Cooley et al., 1969; O'Sullivan and Beikman, 1963). Fan terraces around the foothills of the Carrizo Mountains contain deposits of Pleistocene alluvium which have been extensively mantled with old eolian deposits. Landforms include cuestas, high mesas, structural benches, deep canyons, hills, and broad fan terraces. Cove Mesa and Mexican Cry Mesa are within this subsection. Elevation ranges from about 5,700 to 8,000 ft (1,737 to 2,438 m).

The *Carrizo Dome* is bounded by the Blanding Basin on the north and east and by the Red Rock Bench on the west and south. Surface geology consists mainly of late Cretaceous to early Tertiary igneous rocks intruded as sills, laccoliths, and dikes into several sedimentary formations (Armstrong, 1969; Cooley et al., 1969; O'Sullivan and Beikman, 1963). Quartz diorite porphyry is the igneous rock type forming the core of this area. Many high points in the Carrizo Dome are underlain by sandstone and hard shale, which were metamorphosed by the heat of the intrusions. Landforms consist mainly of the steep slopes, ridges, domes, and narrow canyons of

the Carrizo Mountains. Also present are high mesas, such as Chezhideza, formed by intrusion of sills. The Carrizo Mountains are the southernmost of a group of six laccolithic mountain centers which occur in the interior and eastern portions of the Colorado Plateau province (Armstrong, 1969). Elevation ranges from about 6,800 to 9,400 ft (2,073 to 2,865 m).

The *Tyende Saddle* is bounded by the Blanding Basin and Red Rock Bench to the east and by the Defiance Uplift to the south. Surface geology consists of late Triassic and early Jurassic sedimentary rocks deposited in arid continental environments. It is typified by extensive exposures of the Wingate and Navajo Sandstones (Cooley et al., 1969; Harshbarger et al., 1957; O'Sullivan and Beikman, 1963). Thin surficial deposits of eolian sands form common dunes and sheets across the landscape. Barren sandstone exposed as slickrock is widespread throughout the lower elevations of this subsection. Landforms are dominantly undulating plateaus and structural benches incised by shallow canyons with gently sloping valley floors. Carson Mesa and White Top Mesa occupy the extreme southwestern corner of the survey area within this subsection. A broad, high stream terrace above Trading Post Wash extends to the eastern escarpment of the Black Mesa Basin, which is west of the Shiprock Area. The valley floors of Chinle Wash, Lukachukai Wash, Walker Creek, and Trading Post Wash are major bodies of Holocene alluvium. Elevation ranges from about 4,600 to 6,000 ft (1,402 to 1,829 m).

The *Defiance Uplift* is bounded on the north by the Tyende Saddle and the Red Rock Bench. To the east, it is separated from the Four Corners Platform by the East Defiance monocline. South of Toadlena, New Mexico, a broad zone of Quaternary landslide debris separates the Defiance Uplift from the San Juan Basin (Watson and Wright, 1963). The surface geology consists of early Triassic to early Tertiary sedimentary rocks and by middle Tertiary volcanic rocks (Cooley et al., 1969; New Mexico Geological Society, 1982; O'Sullivan and Beikman, 1963). It is typified by flat-lying, cross-bedded exposures of the Chuska Sandstone which have been locally modified by eruptions and intrusions of basaltic flows, vents, and sills. Also present are tilted beds of the Chinle Formation and Wingate Sandstone on the East Defiance monocline. The Chuska Sandstone has interbedded hard and soft strata. The hard strata are silica-cemented and form the gently sloping summits on mesas and structural benches. These hard strata also give rise to the thin layers of colluvium and alluvium which mantle the underlying soft sandstone bedrock on steep slopes. The geomorphology of this

subsection is dominated by the narrow, northwest-trending, high plateau surface of the Chuska and Lukachukai Mountains (Blagbrough, 1967). Locally prominent mesas and volcanic necks, such as Beautiful Mountain, View Point, and Roof Butte, rise above or protrude from the general plateau level. Other volcanic centers occur at the small calderas of Narbona Pass and in Hidden Valley. Structural benches, hills, open valleys, and rock basins containing marshes and some lakes, typify the surface of the Chuska and Lukachukai Mountains. Landscape dissection caused by streams is greater in the northern end of the Chuska Mountains. Long, steep backslopes bordering canyons are more common north of the headwaters area of Wheatfields Creek than in the southern end of the plateau. The eastern escarpment of the Chuska Mountains is bounded below by a distinct zone of elongated sandstone ridges. These landslide ridge-blocks formed by detachment from the main plateau and slippage on underlying soft sandstone and shale beds (Gregory, 1917; Watson and Wright, 1963). The highest level of landslides grades down slope to older and progressively more subdued topography in the middle and lowest landslide levels. Elevation of the area ranges from about 6,200 ft to over 9,800 ft (1,890 to 2,987 m).

Climate

Information was provided by Frank E. Houghton, former climatologist for New Mexico, National Oceanic and Atmospheric Administration. Robert Becker, meteorologist for the Navajo Nation, helped the principal author prepare this section.

The climate of the Shiprock Area is continental and so displays a large annual variation in temperature. The wide range in elevation and the rugged topography in certain places also produce considerable variations in the moisture climate zones of the survey area. These climate zones range from arid in the relatively low elevation desert areas to subhumid in the high elevation mountains and high plateaus.

Mean annual temperatures range from about 53 degrees F in the deserts to about 40 degrees in cool, shady places of the Chuska Mountains. The diurnal range of temperatures is quite large and may exceed 30 degrees F. Because of the relatively high elevations in the Shiprock Area, winters are generally cold. In winter, the average temperature in Shiprock, New Mexico is about 32 degrees F, and the average daily minimum temperature is about 18 degrees. The average number of days with freezing temperatures in the low elevation deserts is about 160 days.

Temperatures of zero or below will occur on an average of three to four days per year. The lowest temperature on record, which occurred at Shiprock on December 12, 1970, is -26 degrees F. In summer, the average temperature in Shiprock is about 74 degrees F, and the average daily maximum temperature is about 92 degrees. Temperatures of 90 degrees F and higher occur on an average of about 70 days. The highest recorded temperature, which occurred at Shiprock on July 24, 1940, is 109 degrees F.

Mean annual precipitation ranges from as little as 5 inches in the low elevation deserts to as much as 24 inches on the highest elevations in the Chuska Mountains. Precipitation varies widely from month to month and year to year. For example, Shiprock, New Mexico received a total of 15.85 inches of precipitation in 1941, but it received only 1.52 inches in 1976. The amounts of precipitation that are received exhibit a slight maximum in the summer, with over one-third of the annual average falling in the months of July through September. Table 1 gives summaries of data on temperature and precipitation for the survey area as recorded at Shiprock in the period 1948 to 1992 and for Teec Nos Pos, Arizona, in the period 1963 to 1992. Table 2 shows probable dates of the last freezing temperature in spring and the first freezing temperature in fall.

The mean annual precipitation is about 6.8 inches for Shiprock and 8.1 inches for Teec Nos Pos. Of this, 3 to 4 inches, or about 50 percent, usually falls in April through September. The growing season for most crops falls within this period. Generally, more precipitation occurs during the latter half of the growing season than during the first half. August is usually the wettest month of the year in terms of precipitation received, and June is the driest.

The primary source of moisture during the summer monsoon season is air from over the Gulf of Mexico. Southeast winds caused by the circulation patterns around the Bermuda high pressure area shift westward in the summer. This brings moisture-laden tropical air into the southwestern United States. Occasionally, an influx of moisture from the eastern subtropical Pacific occurs in late summer as weakened storm systems from the Gulf of California disintegrate over Arizona and New Mexico. Most summer precipitation falls as heavy rain from brief, isolated, high-intensity convective thunderstorms which are usually accompanied by strong, gusty winds and which occasionally drop hail. Flash flooding in normally dry washes is common during this time of the year.

During the winter, precipitation in the Shiprock Area generally comes in the form of snow and gentle rains, which fall in a widespread pattern. Winter precipitation is produced by Pacific Ocean storm fronts moving inland from the west and is much heavier in the higher elevations of the survey area, where the mountains and high plateaus force the storm systems to rise. The average seasonal snowfall ranges between 3 and 6 inches in the low elevation deserts and between 125 and 150 inches in the Chuska Mountains. Snow accumulates to compacted depths in excess of 50 inches on north-facing aspects in places such as Narbona Pass and Hidden Valley, after strong winds blow it into deep drifts. Snow amounts are highest in the northern part of the Chuska Mountains within the Tsaile Creek watershed.

The frost-free season ranges from as long as 170 days in the desert near Mexican Water, Arizona to only 60 days in the highest elevations of the Chuska Mountains. Table 3 provides data on the length of the growing seasons for Shiprock, New Mexico, and Teec Nos Pos, Arizona.

Sunshine occurs on an annual average of 70 percent of the daylight hours. The sun shines 80 percent of the time in summer and 60 percent in winter. The average relative humidity in mid-afternoon is about 35 percent. Humidity is higher at night, and the average at dawn is about 65 percent. In late spring and early summer afternoons humidity drops as low as 15 to 20 percent.

Spring is a very windy season, and April is the windiest month of the year. Wind speed averages about 12 miles per hour in spring and drops to an average of about 8 miles per hour in fall and winter. The prevailing wind direction is from the west, but the strongest winds in spring are mainly from the southwest. Dust and sand storms occur in spring in the desert areas as loose soil surfaces dry out and are blown by winds in excess of 13 miles per hour. Mean annual evaporation from a free water surface is estimated to be near 60 inches in the desert areas to 40 inches in the mountains and high plateaus. About 70 percent of the annual evaporation occurs during the warmest 6 months of the year, May through October.

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the Shiprock area. The information includes a description of the soils and miscellaneous areas and their

location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down to the unconsolidated material or bedrock in which the soil formed. The unconsolidated material or bedrock is largely devoid of roots and other living organisms and has not been changed by other biological activity.

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept or model of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soil map units. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landform relationships, are sufficient to verify predictions of the kinds of soil and map units in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted color, texture, depth, size and shape of soil peds, kind and amount of rock fragments, distribution of plant roots, reaction, salinity, sodicity, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes called series. Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons

within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses. The analyses are performed at laboratories using proven analytical methods (USDA, 1991). Some simple tests are also performed by soil scientists in an office setting to gather additional data or to confirm laboratory data. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for some of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately. The use of overlapping vertical aerial photographs and optical devices known as stereoscopes enabled the soil scientists to see landscapes and individual landforms in three dimensions. This technique is known as stereoscopy and is an essential tool for the accurate placement of soil delineations (boundaries) in areas of medium to high relief. Different tonal patterns on aerial photographs are often related to distinct differences in soil, slope, vegetation, moisture, erosion, and

geology. Tonal differences are additional tools used by soil scientists to make accurate soil maps on aerial photographs.

This survey area was mapped at two levels of detail. At the more detailed level, map units are narrowly defined. Map unit boundaries were plotted and verified at closely spaced intervals. At the less detailed level, map units are broadly defined. Boundaries were plotted and verified at wider intervals. The narrowly defined units are indicated by an asterisk in the legend for the detailed soil map units. The detail of mapping was selected to meet the anticipated long-term use of the survey, and the map units were designed to meet the needs for that use.

The descriptions, names, and delineations of the soils in this survey area do not fully agree with those of the soils in adjacent survey areas. Differences are the result of a better knowledge of soils, modifications in soil series concepts, variations in the intensity of mapping or in the extent of the soils in the survey areas, or differences in map unit design.

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by several kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a

single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soil on the landscape.

The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of soil data. The objectives of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas.

General Soil Map Units

David W. Seery, biologist, Natural Resources Conservation Service, helped to prepare this section.

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The components of one map unit can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The general soil map units in this survey have been grouped by climate and Major Land Resource Area for broad interpretive purposes. Each of the broad groups and the map units in each group are described in the following pages.

Soil Descriptions

Soils in a warm, arid climate in Major Land Resource Area 37

This group consists of five map units. It makes up about 42 percent of the survey area.

The average elevation is about 5,300 feet. The average annual precipitation is about 7 inches, the average annual air temperature is about 52 degrees F., and the average frost-free period is about 150 days. The vegetation is mainly a mixture of warm and cool-season grasses and shrubs. Many of the shrubs are various species of saltbush (*Atriplex*) (Hodgkinson, 1987). The major soils in this group are brown or gray in color, are generally saline-sodic and

gypsiferous, and formed in materials derived from sandstone, siltstone, and shale bedrock of Cretaceous age.

This group is used for livestock grazing, irrigated cropland and pasture, urban development, and wildlife habitat. Major management concerns are the very low average annual precipitation, soil salinity and sodicity, and the hazards of water erosion and soil blowing.

1. Nageezi-Fruitland-Bebeevvar

Very deep, well drained to moderately well drained soils on high stream terraces, fan terraces, and flood plains

Composition

Nageezi and similar soils: 31 percent
Fruitland and similar soils: 16 percent
Bebeevvar and similar soils: 13 percent
Camac and similar soils: 12 percent
Badland: 6 percent
Minor components: 22 percent

Minor Components

Benally, Razito, and Gyptur soils; Hydric soils in small marshes; Water and Riverwash

Setting

Percent of survey area: 4

Location: Along the San Juan River valley in New Mexico

Landform: **Nageezi**—treads of high stream terraces; **Fruitland**—fan terraces; **Bebeevvar**—flood plains; **Camac**—risers of high stream terraces

Slope: **Nageezi**—1 to 6 percent; **Fruitland**—1 to 3 percent; **Bebeevvar**—0 to 2 percent; **Camac**—15 to 60 percent

Present vegetation: **Nageezi**—Indian ricegrass, broom snakeweed, galleta, and sand dropseed; **Fruitland**—irrigated crops such as alfalfa, apples, and corn or native plants such as galleta, Indian ricegrass, alkali sacaton, and fourwing saltbush; **Bebeevvar**—New Mexico olive, threadleaf rubber rabbitbrush, alkali sacaton, and

Fremont cottonwood; **Camac**—cheatgrass, galleta, Indian ricegrass, and shadscale

Elevation: 4,600 to 5,300 feet

Average annual precipitation: 5 to 8 inches

Average annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Characteristics of the Nageezi Soils

Typical profile

- 0 to 2 inches—light brown loamy fine sand
- 2 to 12 inches—light brown fine sandy loam
- 12 to 42 inches—light brown and pink fine sandy loam

- 42 to 64 inches—light brown loamy sand

Depth class: Very deep

Parent material: Alluvium and eolian material derived from sandstone

Drainage class: Well drained

Permeability: Moderately rapid

Salinity: Slightly saline

Characteristics of the Fruitland Soils

Typical profile

- 0 to 7 inches—yellowish brown sandy clay loam
- 7 to 42 inches—yellowish brown fine sandy loam
- 42 to 65 inches—light yellowish brown sandy clay loam

Depth class: Very deep

Parent material: Alluvium derived from sandstone and shale

Drainage class: Well drained

Permeability: Moderate

Salinity: Very slightly saline

Characteristics of the Bebeever Soils

Typical profile

- 0 to 4 inches—pale brown loamy sand
- 4 to 13 inches—pale brown loamy fine sand
- 13 to 36 inches—pale brown gravelly coarse sand and very gravelly coarse sand

- 36 to 65 inches—light brownish gray sand

Depth class: Very deep

Parent material: Alluvium derived from sandstone, granite, and quartzite

Drainage class: Moderately well drained

Permeability: Moderately rapid

Salinity: Very slightly saline

Flooding frequency: Occasional, very brief periods

Depth to seasonal high water table: 3.5 to 5.0 feet

Characteristics of the Camac Soils

Typical profile

- 0 to 3 inches—brown very cobbly fine sandy loam
- 3 to 17 inches—light yellowish brown and pale brown gravelly loam
- 17 to 22 inches—grayish brown clay loam
- 22 to 31 inches—gray clay loam
- 31 inches—siltstone bedrock

Depth class: Moderately deep

Parent material: Alluvium derived from quartzite and residuum derived from siltstone

Drainage class: Well drained

Permeability: Moderately slow

Salinity: Slightly saline

Sodicity: Slightly sodic

Characteristics of Badland

Badland consists of exposures of shale and siltstone bedrock. It occurs as steep, convex cones, and some vertical faces.

Major Uses

Livestock grazing, irrigated cropland and pasture, urban development, wildlife habitat

Management Concerns

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- The suitability for range seeding is poor because of very low average annual precipitation.
- Irrigation should be provided for crops and pastures.
- The hazard of soil blowing is severe on this unit.
- Bebeever soils are poorly suited for urban development because of occasional flooding and a seasonal high water table.
- Overgrazing reduces available food and cover for wildlife species.
- Competition between domestic livestock and wildlife is high year-round.
- This unit is well suited to the production of herbaceous plants, shrubs, and riparian plants for wildlife habitat.
- Riparian plants such as Fremont cottonwood and coyote willow will grow near water courses where soil moisture is adequate. These types of plants provide habitat for a large number of wildlife species.
- Riparian vegetation should be replanted along drainages where the soil is moist. Protection from livestock grazing is essential.

- Wetlands provide important habitat for wildlife and provide flood protection, recreation opportunities, and water quality enhancement.

Wildlife Habitat

Types of wildlife habitat supported by this unit:

grassland, cropland, badland, riparian, wetland, river

Characteristic wildlife: coyote, Gambel quail, chukar, raccoon, mule deer, songbirds, shorebirds, waterfowl, beaver, ringneck pheasant

Endangered species: bald eagle, peregrine falcon, river otter; Colorado squawfish, humpback chub, and razorback sucker in the San Juan River

2. Persayo-Fordbutte-Ravola

Shallow to very deep, well drained soils on undulating plateaus, cuestras, flood plains, and alluvial fans

Composition

Persayo and similar soils: 40 percent
 Fordbutte and similar soils: 16 percent
 Ravola and similar soils: 13 percent
 Gyptur and similar soils: 9 percent
 Badland: 6 percent
 Minor components: 16 percent

Minor Components

Cairn, Nageezi, Littlehat, Razito, and Blackston soils

Setting

Percent of survey area: 18

Location: Northeastern part of the survey area in New Mexico

Landform: **Persayo**—plateaus and cuestras;

Fordbutte—plateaus and cuestras; **Ravola**—flood plains and alluvial fans; **Gyptur**—plateaus

Slope: **Persayo**—1 to 15 percent; **Fordbutte**—1 to 3 percent; **Ravola**—1 to 3 percent; **Gyptur**—0 to 3 percent; minor components range to 45 percent

Present vegetation: **Persayo**—alkali sacaton, Indian ricegrass, galleta, and sickle saltbush;

Fordbutte—alkali sacaton, galleta, Indian ricegrass, and shadscale; **Ravola**—alkali sacaton, galleta, sickle saltbush, and mound saltbush; **Gyptur**—Indian ricegrass, alkali sacaton, galleta, and Castle Valley clover

Elevation: 4,800 to 6,000 feet

Average annual precipitation: 5 to 8 inches

Average annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Characteristics of the Persayo Soils

Typical profile

- 0 to 2 inches—light yellowish brown very fine sandy loam
- 2 to 18 inches—light brownish gray and light yellowish brown loam
- 18 inches—siltstone bedrock

Depth class: Shallow

Parent material: Alluvium and residuum derived from siltstone

Drainage class: Well drained

Permeability: Moderate or moderately slow

Salinity: Moderately saline

Sodicity: Slightly sodic

Characteristics of the Fordbutte Soils

Typical profile

- 0 to 4 inches—light yellowish brown very fine sandy loam
- 4 to 26 inches—light yellowish brown loam
- 26 to 34 inches—light yellowish brown loam
- 34 inches—siltstone bedrock

Depth class: Moderately deep

Parent material: Alluvium and residuum derived from siltstone

Drainage class: Well drained

Permeability: Moderate

Salinity: Slightly saline

Sodicity: Moderately sodic

Characteristics of the Ravola Soils

Typical profile

- 0 to 10 inches—pale brown and light yellowish brown very fine sandy loam
- 10 to 70 inches—stratified light yellowish brown and pale brown loam and very fine sandy loam

Depth class: Very deep

Parent material: Alluvium derived from siltstone

Drainage class: Well drained

Permeability: Moderate

Flooding frequency: Occasional, very brief periods

Characteristics of the Gyptur Soils

Typical profile

- 0 to 2 inches—light yellowish brown very fine sandy loam
- 2 to 5 inches—brown silty clay loam
- 5 to 17 inches—light brownish gray gypsiferous material which is an apparent loam

- 17 to 46 inches—light brownish gray loam
- 46 inches—siltstone bedrock

Depth class: Deep

Parent material: Alluvium and residuum derived from siltstone and shale

Drainage class: Well drained

Permeability: Moderately slow

Salinity: Strongly saline

Sodicity: Strongly sodic

Characteristics of Badland

Badland consists of exposures of shale and siltstone bedrock. It occurs as steep, convex cones and some vertical faces.

Major Uses

Livestock grazing, wildlife habitat

Management Concerns

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- The suitability for range seeding is poor because of very low average annual precipitation.
- The hazard of soil blowing is severe on this unit.
- Overgrazing reduces available food and cover for wildlife species.
- The small amount of vegetation produced on this unit is offset by the variety of plants, which attracts many species.
- Badland and rock outcrop grow little or no vegetation but are important for nest sites, resting cover, hunting perches, escape sites, and dens.
- Steep slopes and broken topography provide safety from danger for wildlife.

Wildlife Habitat

Types of wildlife habitat supported by this unit:
grassland, badland

Characteristic wildlife: coyote, mule deer, ground squirrels, prairie dogs, gopher, badger, horned lark, red-tailed hawk

3. Kimbeto-Farb-Denazar

Shallow to deep, well drained to somewhat excessively drained soils on plateaus, structural benches, mesas, and cuestas

Composition

Kimbeto and similar soils: 19 percent

Farb and similar soils: 16 percent

Denazar and similar soils: 15 percent

Huerfano and similar soils: 13 percent

Badland: 8 percent

Minor components: 29 percent

Minor Components

Hamburn, Genats, Jeddito, Notal, Escavada, and Nageezi soils

Setting

Percent of survey area: 11

Location: Southeastern part of the survey area in New Mexico

Landform: **Kimbeto**—plateaus and cuestas; **Farb**—plateaus, mesas, structural benches, and cuestas; **Denazar**—plateaus and structural benches; **Huerfano**—plateaus and cuestas

Slope: **Kimbeto**—0 to 4 percent; **Farb**—1 to 25 percent; **Denazar**—0 to 5 percent; **Huerfano**—0 to 3 percent; minor components range to 60 percent

Present vegetation: **Kimbeto**—alkali sacaton, galleta, Indian ricegrass, and shadscale; **Farb**—galleta, alkali sacaton, shadscale, and Bigelow sagebrush; **Denazar**—Indian ricegrass, galleta, sand Mormon tea, and fourwing saltbush; **Huerfano**—alkali sacaton, galleta, ribscale, and mound saltbush

Elevation: 4,900 to 5,900 feet

Average annual precipitation: 5 to 8 inches

Average annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Characteristics of the Kimbeto Soils

Typical profile

- 0 to 3 inches—light brown loamy fine sand
- 3 to 10 inches—light brown fine sandy loam
- 10 to 18 inches—brown sandy clay loam
- 18 to 29 inches—very pale brown and white fine sandy loam
- 29 to 42 inches—brownish yellow loamy fine sand
- 42 inches—soft sandstone bedrock

Depth class: Deep

Parent material: Eolian material, alluvium, and residuum derived from sandstone

Drainage class: Well drained

Permeability: Moderate

Salinity: Moderately saline

Sodicity: Moderately sodic

Characteristics of the Farb Soils

Typical profile

- 0 to 2 inches—pale brown channery loamy fine sand

- 2 to 5 inches—very pale brown fine sandy loam
- 5 to 8 inches—very pale brown channery fine sandy loam
- 8 inches—sandstone bedrock

Depth class: Very shallow

Parent material: Alluvium and residuum derived from sandstone

Drainage class: Well drained

Permeability: Moderately rapid

Characteristics of the Denazar Soils

Typical profile

- 0 to 14 inches—yellowish brown fine sand
- 14 to 31 inches—very pale brown and light yellowish brown loamy fine sand
- 31 to 42 inches—brownish yellow fine sand
- 42 inches—sandstone bedrock

Depth class: Deep

Parent material: Eolian material and residuum derived from sandstone

Drainage class: Somewhat excessively drained

Permeability: Rapid

Characteristics of the Huerfano Soils

Typical profile

- 0 to 1 inch—pale brown sandy clay loam
- 1 to 11 inches—brown sandy clay loam
- 11 to 18 inches—light brownish gray clay loam
- 18 inches—shale bedrock

Depth class: Shallow

Parent material: Alluvium and residuum derived from shale and sandstone

Drainage class: Well drained

Permeability: Moderately slow

Salinity: Moderately saline

Sodicity: Strongly sodic

Characteristics of Badland

Badland consists of exposures of shale bedrock. It occurs as steep, convex cones intermixed with areas of soil.

Major Uses

Livestock grazing, wildlife habitat

Management Concerns

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- The suitability for range seeding is poor because of very low average annual precipitation.
- The hazard of soil blowing is severe on this unit.

- Overgrazing reduces available food and cover for wildlife species.

• The small amount of vegetation produced on this unit is offset by the variety of plants, which attracts many species.

• Badland and rock outcrop grow little or no vegetation but are important for nest sites, resting cover, hunting perches, escape sites, and dens.

• Steep slopes and broken topography provide safety from danger for wildlife.

Wildlife Habitat

Types of wildlife habitat supported by this unit: grassland, Rock outcrop, badland

Characteristic wildlife: coyote, ground squirrels, gopher, badger, prairie dogs, horned lark, red-tailed hawk

4. Tewa-Kimbeto-Shiprock

Deep to very deep, well drained soils on fan terraces, structural benches, plateaus, and cuestas

Composition

Tewa and similar soils: 23 percent

Kimbeto and similar soils: 17 percent

Shiprock and similar soils: 16 percent

Farb and similar soils: 16 percent

Badland: 6 percent

Minor components: 22 percent

Minor Components

Jeddito, Blueflat, Notal, and Ravola soils

Setting

Percent of survey area: 6

Location: Central part of the survey area in New Mexico

Landform: **Tewa**—fan terraces; **Kimbeto**—plateaus and structural benches; **Shiprock**—plateaus and cuestas; **Farb**—plateaus, structural benches, and cuestas

Slope: **Tewa**—2 to 15 percent; **Kimbeto**—0 to 4 percent; **Shiprock**—1 to 5 percent; **Farb**—1 to 25 percent

Present vegetation: **Tewa**—galleta, blue grama, bottlebrush squirreltail, and broom snakeweed; **Kimbeto**—alkali sacaton, galleta, Indian ricegrass, and shadscale; **Shiprock**—Indian ricegrass, galleta, blue grama, and broom snakeweed; **Farb**—galleta, alkali sacaton, shadscale, and Bigelow sagebrush

Elevation: 5,400 to 6,100 feet

Average annual precipitation: 5 to 8 inches
Average annual air temperature: 51 to 54 degrees F.
Frost-free period: 140 to 160 days

Characteristics of the Tewa Soils

Typical profile

- 0 to 3 inches—yellowish brown fine sandy loam
- 3 to 27 inches—light yellowish brown and pale brown fine sandy loam and loam
- 27 to 66 inches—pale brown fine sandy loam and sandy clay loam

Depth class: Very deep

Parent material: Alluvium derived from sandstone

Drainage class: Well drained

Permeability: Moderate

Salinity: Slightly saline

Sodicity: Slightly sodic

Characteristics of the Kimbeto Soils

Typical profile

- 0 to 3 inches—light brown loamy fine sand
- 3 to 10 inches—light brown fine sandy loam
- 10 to 18 inches—brown sandy clay loam
- 18 to 29 inches—very pale brown and white fine sandy loam
- 29 to 42 inches—brownish yellow loamy fine sand
- 42 inches—soft sandstone bedrock

Depth class: Deep

Parent material: Eolian material, alluvium, and residuum derived from sandstone and shale

Drainage class: Well drained

Permeability: Moderate

Salinity: Moderately saline

Sodicity: Moderately sodic

Characteristics of the Shiprock Soils

Typical profile

- 0 to 3 inches—light brown loamy fine sand
- 3 to 36 inches—brown fine sandy loam
- 36 to 66 inches—brown fine sandy loam

Depth class: Very deep

Parent material: Eolian material and alluvium derived from sandstone

Drainage class: Well drained

Permeability: Moderately rapid

Salinity: Slightly saline

Characteristics of the Farb Soils

Typical profile

- 0 to 2 inches—pale brown channery loamy fine sand

- 2 to 5 inches—very pale brown fine sandy loam
- 5 to 8 inches—very pale brown channery fine sandy loam
- 8 inches—sandstone bedrock

Depth class: Very shallow

Parent material: Alluvium and residuum derived from sandstone

Drainage class: Well drained

Permeability: Moderately rapid

Characteristics of Badland

Badland consists of exposures of shale bedrock. It occurs as steep, convex cones intermixed with areas of soil.

Major Uses

Livestock grazing, wildlife habitat

Management Concerns

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- The suitability for range seeding is poor because of very low average annual precipitation.
- The hazard of soil blowing is severe on this unit.
- Overgrazing reduces available food and cover for wildlife species.
- The small amount of vegetation produced on this unit is offset by the variety of plants, which attracts many species.
- Badland and rock outcrop grow little or no vegetation but are important for nest sites, resting cover, hunting perches, escape sites, and dens.
- Steep slopes and broken topography provide safety from danger for wildlife.

Wildlife Habitat

Types of wildlife habitat supported by this unit:

grassland, badland, Rock outcrop

Characteristic wildlife: coyote, ground squirrels, badger, gopher, prairie dogs, burrowing owl, red-tailed hawk

5. Jeddito-Notal-Suwanee

Very deep, well drained soils on low stream terraces, fan terraces, and flood plains

Composition

Jeddito and similar soils: 33 percent

Notal and similar soils: 25 percent

Suwanee and similar soils: 12 percent

Benally and similar soils: 6 percent

Minor components: 24 percent

Minor Components

Escavada, Tewa, and Kimbeto soils; and Riverwash

Setting

Percent of survey area: 3

Location: Southern part of the survey area in New Mexico

Landform: **Jeddito**—low stream terraces; **Notal**—low stream terraces; **Suwanee**—flood plains; **Benally**—eolian-mantled fan terraces

Slope: **Jeddito**—0 to 3 percent; **Notal**—0 to 1 percent; **Suwanee**—0 to 1 percent; **Benally**—1 to 3 percent; minor components range to 15 percent

Present vegetation: **Jeddito**—galleta, sand dropseed, fourwing saltbush, and Russian thistle; **Notal**—mound saltbush, alkali sacaton, Russian thistle, and black greasewood; **Suwanee**—alkali sacaton, fourwing saltbush, threadleaf rubber rabbitbrush, and annual sunflower; **Benally**—alkali sacaton, galleta, Russian thistle, and Indian ricegrass

Elevation: 5,000 to 6,000 feet

Average annual precipitation: 5 to 8 inches

Average annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Characteristics of the Jeddito Soils**Typical profile**

- 0 to 5 inches—light brown loamy fine sand
- 5 to 16 inches—brown loamy sand
- 16 to 33 inches—brown fine sandy loam
- 33 to 70 inches—light brown and brown stratified fine sandy loam to clay loam

Depth class: Very deep

Parent material: Alluvium derived from sandstone and shale

Drainage class: Well drained

Permeability: Moderately slow

Flooding frequency: Rare

Characteristics of the Notal Soils**Typical profile**

- 0 to 3 inches—pale brown silty clay loam
- 3 to 11 inches—grayish brown silty clay loam
- 11 to 70 inches—grayish brown silty clay

Depth class: Very deep

Parent material: Alluvium derived from shale, siltstone, and sandstone

Drainage class: Well drained

Permeability: Very slow

Salinity: Moderately saline

Sodicity: Moderately sodic

Flooding frequency: Rare

Characteristics of the Suwanee Soils**Typical profile**

- 0 to 6 inches—brown loam
- 6 to 12 inches—brown silty clay loam
- 12 to 26 inches—light brown fine sandy loam
- 26 to 64 inches—light brown silt loam and very fine sandy loam

Depth class: Very deep

Parent material: Alluvium derived from sandstone, siltstone, and shale

Drainage class: Well drained

Permeability: Moderately slow

Flooding frequency: Occasional, very brief periods

Characteristics of the Benally Soils**Typical profile**

- 0 to 4 inches—pale brown loamy sand
- 4 to 15 inches—pale brown fine sandy loam
- 15 to 56 inches—brown sandy clay loam and clay loam
- 56 to 64 inches—pale brown loamy sand

Depth class: Very deep

Parent material: Alluvium and eolian material derived from sandstone and shale

Drainage class: Well drained

Permeability: Moderately slow

Salinity: Slightly saline

Sodicity: Moderately sodic

Flooding frequency: Rare

Major Uses

Livestock grazing, wildlife habitat

Management Concerns

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- The suitability for range seeding is poor because of very low average annual precipitation.
- The hazard of soil blowing is severe on this unit.
- Overgrazing reduces available food and cover for wildlife species.

Wildlife Habitat

Types of wildlife habitat supported by this unit: grassland

Characteristic wildlife: coyote, striped skunk, prairie dog, mule deer in winter, mourning dove, horned lark

Soils and Rock outcrop in a warm, arid climate in Major Land Resource Area 35

This group consists of three map units. It makes up about 23 percent of the survey area.

The average elevation is about 5,300 feet. The average annual precipitation is about 7 inches, the average annual air temperature is about 53 degrees F., and the average frost-free period is about 160 days. The vegetation is mainly a mixture of warm and cool-season grasses and shrubs. Major saltbush shrub communities occur locally near the Four Corners Monument and in the Chinle Valley area. The major soils in this group are reddish in color, are generally coarse or moderately coarse textured, and formed dominantly in eolian material derived from sandstone and siltstone bedrock of Triassic and Jurassic age.

This group is used for livestock grazing, irrigated cropland and pasture, urban development, and wildlife habitat. Major management concerns are the very low average annual precipitation and the hazard of soil blowing.

6. Sogzie-Aneth-Whit

Deep to very deep, well drained to somewhat excessively drained soils on plateaus, mesas, cuestas, and fan terraces

Composition

Sogzie and similar soils: 31 percent
Aneth and similar soils: 25 percent
Whit and similar soils: 10 percent
Rock outcrop: 9 percent
Recapture and similar soils: 6 percent
Minor components: 19 percent

Minor Components

Shalet, Piute, Claysprings, and Trail soils

Setting

Percent of survey area: 16

Location: Central and western part of the survey area in Arizona and New Mexico

Landform: **Sogzie**—plateaus, mesas, cuestas;

Aneth—plateaus, mesas, cuestas; **Whit**—fan terraces; **Recapture**—fan terraces

Slope: **Sogzie**—1 to 6 percent; **Aneth**—1 to 8 percent; **Whit**—1 to 3 percent; **Recapture**—1 to 5 percent; minor components range to 60 percent

Present vegetation: **Sogzie**—galleta, Indian ricegrass, broom snakeweed, and Cutler Mormon

tea; **Aneth**—Indian ricegrass, sandhill muhly, Bigelow rubber rabbitbrush, and Cutler Mormon tea; **Whit**—galleta, broom snakeweed, blue grama, and sand dropseed; **Recapture**—alkali sacaton, galleta, Indian ricegrass, and

Drummond goldenweed

Elevation: 5,100 to 6,100 feet

Average annual precipitation: 6 to 8 inches

Average annual air temperature: 52 to 54 degrees F.

Frost-free period: 140 to 160 days

Characteristics of the Sogzie Soils

Typical profile

- 0 to 10 inches—yellowish red loamy fine sand
- 10 to 50 inches—light reddish brown and pink very fine sandy loam
- 50 to 70 inches—reddish yellow fine sandy loam

Depth class: Deep and very deep

Parent material: Eolian material, alluvium, and residuum derived from sandstone and siltstone

Drainage class: Well drained

Permeability: Moderately rapid

Characteristics of the Aneth Soils

Typical profile

- 0 to 8 inches—reddish brown loamy fine sand
- 8 to 28 inches—light reddish brown loamy fine sand
- 28 to 37 inches—light reddish brown fine sandy loam
- 37 to 65 inches—light reddish brown loamy fine sand and fine sandy loam

Depth class: Very deep

Parent material: Eolian material and alluvium derived from sandstone

Drainage class: Somewhat excessively drained

Permeability: Moderately rapid

Characteristics of the Whit Soils

Typical profile

- 0 to 10 inches—yellowish red very fine sandy loam
- 10 to 38 inches—yellowish red and light reddish brown sandy clay loam and loam
- 38 to 65 inches—pink and yellowish red loam and fine sandy loam

Depth class: Very deep

Parent material: Eolian material derived from siltstone and sandstone

Drainage class: Well drained

Permeability: Moderate

Characteristics of Rock Outcrop

Rock outcrop consists of exposures of sandstone bedrock. It occurs as gently to moderately sloping slickrock, and as steeply sloping to vertical cliffs and spires.

Characteristics of the Recapture Soils

Typical profile

- 0 to 3 inches—light reddish brown loamy fine sand
- 3 to 17 inches—reddish brown fine sandy loam and sandy clay loam
- 17 to 39 inches—light reddish brown and reddish brown sandy clay loam and clay loam
- 39 to 53 inches—yellowish red fine sandy loam
- 53 to 65 inches—light reddish brown loamy fine sand

Depth class: Very deep

Parent material: Alluvium derived from sandstone and shale

Drainage class: Well drained

Permeability: Moderately slow

Salinity: Moderately saline

Sodicity: Strongly sodic

Major Uses

Livestock grazing, wildlife habitat

Management Concerns

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- The suitability for range seeding is poor because of very low average annual precipitation.
- The hazard of soil blowing is severe on this unit.
- Overgrazing reduces available food and cover for wildlife species.
- Rock outcrop supports little or no vegetation but is important for nest sites, resting cover, hunting perches, escape sites, and dens.
- Steep slopes and broken topography provide safety from danger for wildlife.

Wildlife Habitat

Types of wildlife habitat supported by this unit:
grassland, Rock outcrop

Characteristic wildlife: badger, Lazuli bunting, turkey

vulture, prairie dogs, jackrabbit, red-tailed hawk, horned lark

7. Sheppard-Rock Outcrop-Piute

Very shallow to very deep, well drained to somewhat excessively drained soils on plateaus, structural benches, and fan terraces; and Rock outcrop

Composition

Sheppard and similar soils: 27 percent

Rock outcrop: 23 percent

Piute and similar soils: 18 percent

Moffat and similar soils: 18 percent

Minor components: 14 percent

Minor Components

Pennell, Kaito, Claysprings, Recapture, Sogzie, Shorthair, and Shalet soils; and Riverwash

Setting

Percent of survey area: 5

Location: Northwestern part of the survey area in Arizona (fig. 2)

Landform: **Sheppard**—plateaus and structural benches; **Piute**—structural benches; **Moffat**—fan terraces

Slope: **Sheppard**—2 to 8 percent; **Piute**—2 to 25 percent; **Moffat**—1 to 12 percent; minor components range to 65 percent

Present vegetation: **Sheppard**—sandhill muhly, Indian ricegrass, Bigelow rubber rabbitbrush, and Cutler Mormon tea; **Piute**—blackbrush, Bigelow sagebrush, Torrey Mormon tea, and Indian ricegrass; **Moffat**—blackbrush, Indian ricegrass, galleta, and Cutler Mormon tea

Elevation: 4,600 to 6,000 feet

Average annual precipitation: 5 to 8 inches

Average annual air temperature: 54 to 56 degrees F.

Frost-free period: 150 to 170 days

Characteristics of the Sheppard Soils

Typical profile

- 0 to 3 inches—reddish brown loamy fine sand
 - 3 to 70 inches—yellowish red loamy fine sand
- Depth class:* Very deep



Figure 2.—An area of general soil map unit 7 east of Chinle Creek. Blackbrush is a common low-growing shrub on shallow or calcareous soils such as the Piute and Moffat series. Areas of slickrock are widespread in this general soil map unit which occurs in a warm, arid climate zone in major land resource area 35.

Parent material: Eolian material derived from sandstone

Drainage class: Somewhat excessively drained

Permeability: Rapid

Characteristics of Rock Outcrop

Rock outcrop consists of exposures of sandstone bedrock. It occurs as gently to moderately sloping slickrock, and as steeply sloping to vertical cliffs and spires.

Characteristics of the Piute Soils

Typical profile

- 0 to 3 inches—yellowish red gravelly loamy fine sand
- 3 to 7 inches—light reddish brown fine sand
- 7 inches—sandstone bedrock

Depth class: Very shallow

Parent material: Eolian material and residuum derived from sandstone

Drainage class: Well drained

Permeability: Rapid

Characteristics of the Moffat Soils

Typical profile

- 0 to 6 inches—yellowish red loamy fine sand
- 6 to 28 inches—reddish yellow fine sandy loam
- 28 to 47 inches—pink and white fine sandy loam
- 47 to 65 inches—pink and light reddish brown fine sandy loam

Depth class: Very deep

Parent material: Alluvium and eolian material derived from sandstone and siltstone

Drainage class: Well drained

Permeability: Moderately rapid

Major Uses

Livestock grazing, wildlife habitat

Management Concerns

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- The suitability for range seeding is poor because of very low average annual precipitation.
- The hazard of soil blowing is severe on this unit.
- Overgrazing reduces available food and cover for wildlife species.
- Rock outcrop supports little or no vegetation but is important for nest sites, resting cover, hunting perches, escape sites, and dens.
- Steep slopes and broken topography provide safety from danger for wildlife.

Wildlife Habitat

Types of wildlife habitat supported by this unit:
grassland, Rock outcrop

Characteristic wildlife: white-throated woodrat, white-tailed antelope squirrel, deer mouse, badger, lark bunting, barn swallow, red-tailed hawk, big brown bat, western pipistrelle

8. Shumbegay-Uzaneva-Trail

Very deep, well drained to somewhat excessively drained soils on low stream terraces, flood plains, and alluvial fans

Composition

Shumbegay and similar soils: 21 percent
Uzaneva and similar soils: 20 percent
Trail and similar soils: 14 percent
Gotho and similar soils: 12 percent
Outpost and similar soils: 12 percent
Minor components: 21 percent

Minor Components

Escavada, Mack, Sandbench, and Blackston soils;
Riverwash and Rock outcrop

Setting

Percent of survey area: 2

Location: Western part of the survey area in Arizona, on valley floors

Landform: Shumbegay—low stream terraces; Uzaneva—low stream terraces; Trail—flood plains and alluvial fans; Gotho—low stream terraces; Outpost—flood plains

Slope: Shumbegay—0 to 8 percent; Uzaneva—0 to 2 percent; Trail—1 to 3 percent; Gotho—0 to 2 percent; Outpost—0 to 2 percent

Present vegetation: Shumbegay—black greasewood, Torrey seapweed, sand dropseed, and Russian-thistle; Uzaneva—mound saltbush, black greasewood, and some irrigated crops; Trail—cheatgrass, Russian-thistle, and black greasewood; Gotho—black greasewood, galleta, Russian-thistle, and some irrigated crops; Outpost—alkali sacaton, galleta, and Russian-thistle

Elevation: 4,600 to 6,000 feet

Average annual precipitation: 5 to 8 inches

Average annual air temperature: 52 to 56 degrees F.

Frost-free period: 140 to 170 days

Characteristics of the Shumbegay Soils

Typical profile

- 0 to 2 inches—light reddish brown loamy fine sand
- 2 to 6 inches—red loamy fine sand
- 6 to 10 inches—reddish yellow loamy fine sand
- 10 to 80 inches—stratified reddish yellow fine sand and loamy fine sand with lenses of very fine sandy loam and silt loam

Depth class: Very deep

Parent material: Eolian material and alluvium derived from sandstone and siltstone

Drainage class: Somewhat excessively drained

Permeability: Moderately rapid

Sodicity: Moderately sodic

Characteristics of the Uzaneva Soils

Typical profile

- 0 to 1 inch—reddish brown clay loam
- 1 to 13 inches—reddish brown clay
- 13 to 25 inches—light reddish brown silty clay loam
- 25 to 62 inches—light reddish brown silty clay loam
- 62 to 80 inches—reddish brown and light reddish brown silty clay and silty clay loam

Depth class: Very deep

Parent material: Alluvium derived from shale and siltstone

Drainage class: Well drained

Permeability: Very slow

Sodicity: Moderately sodic

Flooding frequency: Rare

Characteristics of the Trail Soils

Typical profile

- 0 to 5 inches—reddish brown loamy fine sand

- 5 to 27 inches—stratified light brown and light reddish brown fine sand and sand
- 27 to 38 inches—stratified reddish brown and light brown loamy fine sand and silt loam
- 38 to 70 inches—stratified light reddish brown sand and fine sand

Depth class: Very deep

Parent material: Alluvium derived from sandstone and siltstone

Drainage class: Somewhat excessively drained

Permeability: Moderately rapid

Flooding frequency: Occasional, very brief periods

Characteristics of the Gotho Soils

Typical profile

- 0 to 2 inches—red fine sandy loam
- 2 to 13 inches—red clay loam and sandy clay loam
- 13 to 57 inches—red sandy clay loam and fine sandy loam
- 57 to 66 inches—reddish brown clay loam

Depth class: Very deep

Parent material: Alluvium derived from sandstone, siltstone, and shale

Drainage class: Well drained

Permeability: Moderately slow

Sodicity: Moderately sodic

Flooding frequency: Rare

Characteristics of the Outpost Soils

Typical profile

- 0 to 3 inches—pale brown sandy clay loam
- 3 to 35 inches—pale brown and light grayish brown clay loam and silty clay
- 35 to 58 inches—pale brown stratified sandy loam to silt loam
- 58 to 80 inches—pale brown stratified loamy sand to silty clay loam

Depth class: Very deep

Parent material: Alluvium derived from sandstone and shale

Drainage class: Well drained

Permeability: Slow in upper part and moderate in lower part

Flooding frequency: Occasional, very brief periods

Major Uses

Livestock grazing, irrigated cropland and pasture, urban development, wildlife habitat

Management Concerns

- Continuous, intensive year-round grazing results in

a deteriorated plant community that has low value as forage.

- The suitability for range seeding is poor because of very low average annual precipitation.
- The hazard of soil blowing is severe on this unit.
- Irrigation should be provided for crops and pastures.
- The sodicity and permeability of the Uzaneva and Gotho soils is a limitation for agriculture.
- The Uzaneva, Trail, Gotho, and Outpost soils are poorly suited to urban development because of flooding frequency.
- Overgrazing reduces available food and cover for wildlife species.
- Competition between domestic livestock and wildlife is high year-round.
- Small areas of this unit are well suited to the production of herbaceous plants, shrubs, and riparian plants for wildlife habitat.
- Riparian plants such as Fremont cottonwood and coyote willow will grow near water courses where soil moisture is adequate. These types of plants provide habitat for a large number of wildlife species.
- Riparian vegetation should be replanted along drainages where the soil is moist. Protection from livestock grazing is essential.

Wildlife Habitat

Types of wildlife habitat supported by this unit:
grassland, cropland, riparian

Characteristic wildlife: striped skunk, kangaroo rat, cottontail rabbit, northern shrike, western meadowlark

Soils in a warm, semiarid climate in Major Land Resource Area 35

This group consists of two map units. It makes up about 18 percent of the survey area.

The average elevation is about 6,100 feet. The average annual precipitation is about 10 inches, the average annual air temperature is about 51 degrees F., and the average frost-free period is about 140 days. The vegetation is mainly a mixture of warm and cool-season grasses and shrubs, with areas of marginal pinyon-juniper woodland on shallow soils. The major soils in this group are brown, red, or variegated in color, range from coarse textured to fine textured, and formed in materials derived from bedrock of many lithologies and geologic ages.

This group is used for livestock grazing, limited woodland production, and wildlife habitat. It is also used for irrigated cropland and pasture, in a few

places. Major management concerns are the low average annual precipitation, the continued spread and dominance of shrubby vegetation, and the hazards of soil blowing and water erosion.

9. Arches-Kitsili-Blanding

Shallow to very deep, well drained soils on plateaus, mesas, structural benches, and fan terraces

Composition

Arches and similar soils: 21 percent
 Kitsili and similar soils: 21 percent
 Blanding and similar soils: 13 percent
 Rock outcrop: 11 percent
 Millett and similar soils: 10 percent
 Minor components: 24 percent

Minor Components

Kinusta, Beclabito, Eslendo, and Shoegame soils

Setting

Percent of survey area: 11

Location: West-central part of the survey area in Arizona and New Mexico (fig. 3)

Landform: **Arches**—structural benches; **Kitsili**—fan terraces; **Blanding**—eolian-mantled fan terraces and mesas; **Millett**—fan terraces

Slope: **Arches**—4 to 25 percent; **Kitsili**—1 to 8 percent; **Blanding**—2 to 8 percent; **Millett**—2 to 6 percent; minor components—range to 70 percent

Present vegetation: **Arches**—Indian ricegrass, blue grama, Bigelow sagebrush, and Utah juniper; **Kitsili**—Indian ricegrass, blue grama, galleta, and Greene rabbitbrush; **Blanding**—galleta, blue



Figure 3.—An area of general soil map unit 9 east of Alcove Canyon in Arizona. Plants such as Utah juniper, Stansbury cliffrose, and Wyoming big sagebrush are present in this warm, semiarid climate zone in major land resource area 35. Shallow soils over sandstone and very deep soils derived from eolian material dominate this general soil map unit.

grama, Fendler threeawn, and Wyoming big sagebrush; **Millett**—needleandthread, galleta, Utah juniper, and broom snakeweed

Elevation: 5,500 to 6,500 feet

Average annual precipitation: 8 to 12 inches

Average annual air temperature: 50 to 52 degrees F.

Frost-free period: 130 to 150 days

Characteristics of the Arches Soils

Typical profile

- 0 to 3 inches—yellowish red loamy fine sand
- 3 to 14 inches—yellowish red and red loamy fine sand
- 14 to 18 inches—light reddish brown sand
- 18 inches—sandstone bedrock

Depth class: Shallow

Parent material: Eolian material and residuum derived from sandstone

Drainage class: Well drained

Permeability: Rapid

Characteristics of the Kitsili Soils

Typical profile

- 0 to 7 inches—reddish brown fine sandy loam
- 7 to 14 inches—reddish brown fine sandy loam
- 14 to 64 inches—reddish brown fine sandy loam and very fine sandy loam

Depth class: Very deep

Parent material: Alluvium and eolian material derived from sandstone

Drainage class: Well drained

Permeability: Moderately rapid

Characteristics of the Blanding Soils

Typical profile

- 0 to 2 inches—reddish brown very fine sandy loam
- 2 to 9 inches—reddish brown very fine sandy loam
- 9 to 24 inches—yellowish red sandy clay loam
- 24 to 63 inches—light reddish brown and yellowish red sandy clay loam

Depth class: Very deep

Parent material: Eolian material derived from siltstone and sandstone

Drainage class: Well drained

Permeability: Moderate

Characteristics of Rock Outcrop

Rock outcrop consists of exposures of sandstone bedrock. It occurs as gently to moderately sloping slickrock, and as steeply sloping to vertical cliffs and spires.

Characteristics of the Millett Soils

Typical profile

- 0 to 2 inches—yellowish red gravelly fine sandy loam
- 2 to 6 inches—reddish brown gravelly fine sandy loam
- 6 to 16 inches—light reddish brown gravelly sandy clay loam
- 16 to 31 inches—white very gravelly sandy loam
- 31 to 64 inches—pink and reddish brown very cobbly sandy loam

Depth class: Very deep

Parent material: Alluvium derived from sandstone and quartz diorite

Drainage class: Well drained

Permeability: Moderate

Major Uses

Livestock grazing, wildlife habitat

Management Concerns

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- The hazard of soil blowing is severe on this unit.
- The suitability for range seeding is poor for the Arches and Millett soils because of soil limitations, but fair for the Kitsili and Blanding soils.
- Overgrazing reduces available food and cover for wildlife species.
- Rock outcrop supports little or no vegetation but is important for nest sites, resting cover, hunting perches, escape sites, and dens.
- Steep slopes and broken topography provide safety from danger for wildlife.

Wildlife Habitat

Types of wildlife habitat supported by this unit:
grassland, Rock outcrop

Characteristic wildlife: badger, jackrabbit, mule deer, turkey vulture, mourning dove, Lazuli bunting, horned lark, red-tailed hawk, western pipistrelle

10. Farview-McElmo-Millett

Very shallow to very deep, well drained soils on mesas, cuevas, structural benches, and stable landslides

Composition

Farview and similar soils: 24 percent
McElmo and similar soils: 13 percent

Millett and similar soils: 12 percent
 Sanostee and similar soils: 11 percent
 Strych and similar soils: 11 percent
 Minor components: 29 percent

Minor Components

Rock outcrop; Eagleye and Toadlena soils

Setting

Percent of survey area: 7

Location: East-central part of the survey area in New Mexico and Arizona

Landform: **Farview**—mesas, structural benches, and cuestas; **McElmo**—cuestas; **Millett**—stable landslides; **Sanostee**—mesas and cuestas; **Strych**—stable landslides

Slope: **Farview**—1 to 10 percent; **McElmo**—5 to 15 percent; **Millett**—10 to 35 percent; **Sanostee**—1 to 10 percent; **Strych**—15 to 70 percent

Present vegetation: **Farview**—Utah juniper-pinyon woodland with understory of New Mexico feathergrass, Indian ricegrass, and true mountainmahogany; **McElmo**—galleta, sand dropseed, alkali sacaton, and mound saltbush; **Millett**—galleta, blue grama, needleandthread, and Utah juniper; **Sanostee**—blue grama, galleta, Bigelow sagebrush, and southwest rabbitbrush; **Strych**—New Mexico feathergrass, galleta, alkali sacaton, and Utah juniper

Elevation: 5,300 to 7,000 feet

Average annual precipitation: 8 to 12 inches

Average annual air temperature: 50 to 52 degrees F.

Frost-free period: 130 to 150 days

Characteristics of the Farview Soils

Typical profile

- 0 to 2 inches—light brown channery loamy sand
- 2 to 6 inches—light brown channery sandy loam
- 6 inches—sandstone bedrock

Depth class: Very shallow

Parent material: Alluvium and eolian material derived from sandstone

Drainage class: Well drained

Permeability: Moderately rapid

Characteristics of the McElmo Soils

Typical profile

- 0 to 1 inch—light reddish brown very gravelly sandy clay loam
- 1 to 14 inches—yellowish red and light reddish brown gravelly clay and clay
- 14 to 30 inches—pink cobbly silty clay loam

- 30 to 54 inches—pink gypsiferous material which is an apparent silty clay loam
- 54 inches—shale bedrock

Depth class: Deep

Parent material: Alluvium and residuum derived from shale and sandstone

Drainage class: Well drained

Permeability: Slow

Salinity: Moderately saline

Sodicity: Moderately sodic

Characteristics of the Millett Soils

Typical profile

- 0 to 2 inches—brown very cobbly fine sandy loam
- 2 to 14 inches—brown cobbly sandy clay loam
- 14 to 26 inches—pinkish gray very cobbly fine sandy loam
- 26 to 63 inches—pinkish white and light brown very cobbly fine sandy loam and very gravelly fine sandy loam

Depth class: Very deep

Parent material: Alluvium and colluvium derived from sandstone

Drainage class: Well drained

Permeability: Moderate

Characteristics of the Sanostee Soils

Typical profile

- 0 to 2 inches—light brown loamy fine sand
- 2 to 15 inches—brown and light brown sandy clay loam
- 15 to 24 inches—white loam
- 24 to 32 inches—light gray and very pale brown loam and sandy loam
- 32 inches—sandstone bedrock

Depth class: Moderately deep

Parent material: Eolian material, alluvium, and residuum derived from sandstone and siltstone

Drainage class: Well drained

Permeability: Moderate

Characteristics of the Strych Soils

Typical profile

- 0 to 3 inches—pale brown extremely flaggy very fine sandy loam
- 3 to 15 inches—very pale brown very flaggy very fine sandy loam
- 15 to 47 inches—very pale brown and light yellowish brown very stony very fine sandy loam
- 47 to 64 inches—light yellowish brown very stony very fine sandy loam

Depth class: Very deep

Parent material: Colluvium derived from sandstone

Drainage class: Well drained

Permeability: Moderately rapid

Major Uses

Livestock grazing, woodland production, wildlife habitat

Management Concerns

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- The hazard of soil blowing is severe for the Farview and Sanostee soils.
- Overgrazing reduces available food and cover for wildlife species.
- The suitability for range seeding is poor because of soil-related limitations, for all components but the Sanostee soil.
- Some soils in this unit are suited to production of coniferous trees.
- Woodlands of pinyon and juniper provide habitat for many species.
- Fuelwood gatherers should not disturb nest trees.
- Rock outcrop supports little or no vegetation but is important for nest sites, resting cover, hunting perches, escape sites, and dens.
- Steep slopes and broken topography provide safety from danger for wildlife.

Wildlife Habitat

Types of wildlife habitat supported by this unit:
grassland, woodland, Rock outcrop

Characteristic wildlife: coyote, mule deer, bobcat, prairie dogs, common raven, evening grosbeak, great horned owl; pronghorn antelope on Palmer Mesa

Soils in a cool, dry-subhumid climate in Major Land Resource Area 36

This group consists of two map units. It makes up about 8 percent of the survey area.

The average elevation is about 7,000 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 49 degrees F., and the average frost-free period is about 130 days. The vegetation is mainly twoneedle pinyon-Utah juniper woodland, with an understory consisting of shrubs and cool-season grasses. The major soils in this group are brown to red in color, are moderately

coarse to moderately fine textured, and formed in materials derived from bedrock of many lithologies and geologic ages.

This group is used for woodland production, livestock grazing, and wildlife habitat. It is also used for irrigated cropland and pasture, in a few places. Major management concerns are the hazard of water erosion, the continued spread and dominance of shrubby vegetation, and the presence of shallow soils and steep, rocky slopes.

11. Iwela-Nomrah-Menefee

Shallow to very deep, well drained soils on stable landslides, hills, cuestas, and escarpments

Composition

Iwela and similar soils: 32 percent
Nomrah and similar soils: 21 percent
Menefee and similar soils: 14 percent
Vosburg and similar soils: 9 percent
Highdye and similar soils: 9 percent
Minor components: 15 percent

Minor Components

Espiritu, Vessilla, Tsezhin, and Sojourn soils; Rock outcrop and Badland

Setting

Percent of survey area: 2

Location: East of the Chuska Mountain range in New Mexico

Landform: **Iwela**—stable landslides; **Nomrah**—stable landslides; **Menefee**—hills and escarpments;

Vosburg—stable landslides; **Highdye**—cuestas

Slope: **Iwela**—10 to 40 percent; **Nomrah**—2 to 10 percent; **Menefee**—10 to 55 percent; **Vosburg**—1 to 5 percent; **Highdye**—5 to 20 percent

Present vegetation: **Iwela** and **Nomrah**—pinyon-Utah juniper woodland with understory of Wyoming big sagebrush, black sagebrush, muttongrass, and bottlebrush squirreltail; **Menefee**—pinyon-Utah juniper woodland with understory of Utah serviceberry, datil yucca, true mountainmahogany, and thrifty goldenweed; **Highdye**—pinyon-Utah juniper woodland with understory of muttongrass, bottlebrush squirreltail, and Gambel oak; **Vosburg**—western wheatgrass, blue grama, bottlebrush squirreltail, and Wyoming big sagebrush

Elevation: 6,400 to 8,000 feet

Average annual precipitation: 12 to 16 inches
Average annual air temperature: 48 to 50 degrees F.
Frost-free period: 120 to 140 days

Characteristics of the Iwela Soils

Typical profile

- 0 to 3 inches—dark brown very cobbly fine sandy loam
- 3 to 9 inches—reddish brown gravelly sandy clay loam
- 9 to 26 inches—brown and light brown cobbly sandy clay loam
- 26 to 44 inches—very pale brown very stony sandy loam
- 44 to 64 inches—very pale brown very stony loamy sand

Depth class: Very deep

Parent material: Colluvium derived from sandstone and shale

Drainage class: Well drained

Permeability: Moderate in upper part and rapid in lower part

Characteristics of the Nomrah Soils

Typical profile

- 0 to 3 inches—dark brown fine sandy loam
- 3 to 32 inches—brown and yellowish red sandy clay loam
- 32 to 58 inches—light reddish brown sandy clay loam
- 58 to 62 inches—strong brown fine sandy loam

Depth class: Very deep

Parent material: Eolian material and alluvium derived from sandstone

Drainage class: Well drained

Permeability: Moderate

Characteristics of the Menefee Soils

Typical profile

- 0 to 2 inches—brown channery loam
- 2 to 5 inches—brown loam
- 5 to 17 inches—light yellowish brown loam
- 17 inches—siltstone bedrock

Depth class: Shallow

Parent material: Alluvium, colluvium, and residuum derived from siltstone, shale, and sandstone

Drainage class: Well drained

Permeability: Moderately slow

Characteristics of the Vosburg Soils

Typical profile

- 0 to 7 inches—dark brown loam
- 2 to 36 inches—dark brown clay loam
- 36 to 65 inches—brown sandy clay loam

Depth class: Very deep

Parent material: Alluvium derived from sandstone and shale

Drainage class: Well drained

Permeability: Moderate

Characteristics of the Highdye Soils

Typical profile

- soil surface covered by 1 inch of pinyon needles, twigs, and oak leaves
- 0 to 4 inches—brown flaggy fine sandy loam
- 4 to 13 inches—brown sandy clay
- 13 inches—sandstone bedrock

Depth class: Shallow

Parent material: Eolian material, alluvium, and residuum derived from shale and sandstone

Drainage class: Well drained

Permeability: Slow

Major Uses

Woodland production, livestock grazing, wildlife habitat

Management Concerns

- Access to this unit is restricted by moderate amounts of snow in winter, and by soil wetness in early spring and late fall.
- Where density of the tree canopy exceeds 30 percent, understory vegetation for livestock grazing is limited.
- Maintaining the understory vegetation is essential in controlling erosion.
- Overgrazing reduces available food and cover for wildlife species.
- This unit is moderately suited to production of coniferous trees.
- Woodlands of pinyon and juniper provide habitat for many species.
- Fuelwood gatherers and wood cutters should leave nest trees and large nut producing pinyon trees.

- Rock outcrop and badland grow little or no vegetation but are important for nest sites, resting cover, hunting perches, escape sites, and dens.
- Steep slopes and broken topography provide safety from danger for wildlife.

Wildlife Habitat

Types of wildlife habitat supported by this unit:

woodland, grassland, Rock outcrop, badland

Characteristic wildlife: mule deer, porcupine, bobcat, pinyon jay, wild turkey, prairie dog, jackrabbit, dark-eyed junco, robin, great horned owl, golden eagle

12. Wetherill-Tsezhin-Nizhoni

Very shallow to very deep, well drained soils on

mesas, cuestras, fan terraces, alluvial cones, and structural benches

Composition

Wetherill and similar soils: 25 percent

Tsezhin and similar soils: 19 percent

Nizhoni and similar soils: 16 percent

Sojourn and similar soils: 11 percent

Minor components: 29 percent

Minor Components

Chazner, Hozho, Quezcan, Chinlini, and Atlatl soils;
Rock outcrop and Badland

Setting

Percent of survey area: 6

Location: Central part of the survey area in Arizona and New Mexico (fig. 4)

Landform: **Wetherill**—eolian-mantled fan terraces and



Figure 4.—An area of general soil map unit 12 west of Sanostee, New Mexico, displaying east-dipping cuestras and canyons with dense pinyon-juniper woodland. This unit is in a cool, dry-subhumid climate zone in major land resource area 36. Roof Butte in the northern end of the Chuska Mountains is in the far right background and is the highest point in the Shiprock Area.

mesas; **Tsezhin**—fan terraces and alluvial cones; **Nizhoni**—cuestas, structural benches, and mesas; **Sojourn**—hills and escarpments

Slope: **Wetherill**—1 to 60 percent; **Tsezhin**—5 to 70 percent; **Nizhoni**—2 to 20 percent; **Sojourn**—15 to 50 percent

Present vegetation: pinyon-Utah juniper woodland with the following understory plants: **Wetherill**—Wyoming big sagebrush, bottlebrush squirreltail, cheatgrass, and green Mormon tea; **Tsezhin**—black sagebrush, Wyoming big sagebrush, datil yucca, and muttongrass; **Nizhoni**—muttongrass, Indian ricegrass, true mountainmahogany, and Stansbury cliffrose; **Sojourn**—Utah serviceberry, Utah snowberry, Stansbury cliffrose, and green Mormon tea

Elevation: 6,200 to 8,000 feet

Average annual precipitation: 12 to 16 inches

Average annual air temperature: 48 to 50 degrees F.

Frost-free period: 120 to 140 days

Characteristics of the Wetherill Soils

Typical profile

- 0 to 3 inches—brown very fine sandy loam
- 3 to 18 inches—reddish brown loam
- 18 to 35 inches—light reddish brown clay loam
- 35 to 70 inches—strong brown and light brown loam

Depth class: Very deep

Parent material: Eolian material derived from siltstone and sandstone

Drainage class: Well drained

Permeability: Moderate

Characteristics of the Tsezhin Soils

Typical profile

- 0 to 2 inches—reddish brown very cobbly very fine sandy loam
- 2 to 35 inches—yellowish red very gravelly clay loam
- 35 to 51 inches—yellowish red with pinkish white very cobbly clay loam
- 51 to 65 inches—yellowish red very cobbly clay loam

Depth class: Very deep

Parent material: Alluvium derived from sandstone, shale, and quartz diorite

Drainage class: Well drained

Permeability: Moderately slow

Characteristics of the Nizhoni Soils

Typical profile

- 0 to 3 inches—yellowish red very fine sandy loam
- 3 to 7 inches—red and dark reddish gray fine sandy loam
- 7 inches—sandstone bedrock

Depth class: Very shallow

Parent material: Eolian material and residuum derived from sandstone

Drainage class: Well drained

Permeability: Moderately rapid

Characteristics of the Sojourn Soils

Typical profile

- 0 to 2 inches—light reddish brown gravelly loam
- 2 to 15 inches—light reddish brown silt loam
- 15 inches—siltstone bedrock

Depth class: Shallow

Parent material: Residuum derived from siltstone

Drainage class: Well drained

Permeability: Moderate

Major Uses

Woodland production, livestock grazing, wildlife habitat

Management Concerns

- Access to this unit is restricted by moderate amounts of snow in winter, and by soil wetness in early spring and late fall.
- Where density of the tree canopy exceeds 30 percent, understory vegetation for livestock grazing is limited.
- Maintaining the understory vegetation is essential in controlling erosion.
- On very shallow soils such as Nizhoni, cryptogamic soil crusts are important in preventing erosion by water.
- Overgrazing reduces available food and cover for wildlife species.
- This unit is moderately suited to production of coniferous trees.
- Woodlands of pinyon and juniper provide habitat for many species.
- Fuelwood gatherers and wood cutters should leave nest trees and large nut producing pinyon trees.
- Rock outcrop and badland grow little or no vegetation but are important for nest sites, resting cover, hunting perches, escape sites, and dens.

- Steep slopes and broken topography provide safety from danger for wildlife.

Wildlife Habitat

Types of wildlife habitat supported by this unit:

woodland, Rock outcrop, badland

Characteristic wildlife: mule deer, porcupine, bobcat, black bear, wild turkey, pinyon jay, ladder-backed woodpecker, mourning dove, band-tailed pigeon, big brown bat, California myotis, red-tailed hawk, golden eagle

Endangered species: Mexican spotted owl

Soils in a cold, subhumid climate in Major Land Resource Area 39 and a cool, dry-subhumid climate in Major Land Resource Area 36

This group consists of one map unit. It makes up about 2 percent of the survey area.

The average elevation is about 8,200 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 46 degrees F., and the average frost-free period is about 110 days. The vegetation is mainly twoneedle pinyon-Utah juniper woodland and Douglas-fir forest, with an understory consisting of shrubs and cool-season grasses. Open areas occur on the summit of the Carrizo Mountains and are dominated by black sagebrush and scattered Gambel oak trees. The major soils in this group are either high in rock fragment content or shallow to bedrock, occur on steep slopes, and formed in materials derived dominantly from Tertiary age quartz diorite and Jurassic age sandstone.

This group is used for woodland production, livestock grazing, and wildlife habitat. Major management concerns are steep rocky slopes, the continued spread and dominance of shrubby vegetation, and the hazard of water erosion.

13. Ligai-Pastorpeak-Arabrab

Shallow to very deep, well drained soils on mountains, cuestas, and mesas

Composition

Ligai and similar soils: 26 percent
 Pastorpeak and similar soils: 22 percent
 Arabrab and similar soils: 11 percent
 Zibetod and similar soils: 9 percent
 Bigpaw and similar soils: 9 percent
 Minor components: 23 percent

Minor Components

Chazner and Wetherill soils; Rock outcrop

Setting

Percent of survey area: 2

Location: The Carrizo Mountains area in Arizona

Landform: **Pastorpeak and Ligai**—backslopes of mountains; **Arabrab**—mesas and cuestas;

Zibetod and Bigpaw—summits of mountains

Slope: **Pastorpeak**—50 to 95 percent; **Ligai**—35 to 70 percent; **Arabrab**—5 to 60 percent; **Zibetod**—15 to 35 percent; **Bigpaw**—5 to 15 percent

Present vegetation: **Pastorpeak**—Douglas-fir forest with understory of nodding brome grass, mountain snowberry, Gambel oak, and common chokecherry; **Ligai**—pinyon woodland with understory of muttongrass, bottlebrush squirreltail, earth sedge, and Gambel oak; **Arabrab**—pinyon-Utah juniper woodland with understory of muttongrass, earth sedge, datil yucca, and thrifty goldenweed; **Zibetod**—muttongrass, senecio, black sagebrush, and Gambel oak; **Bigpaw**—black sagebrush, muttongrass, bottlebrush squirreltail, and trailing fleabane

Elevation: 7,000 to 9,400 feet

Average annual precipitation: 12 to 20 inches

Average annual air temperature: 42 to 50 degrees F.

Frost-free period: 80 to 140 days

Characteristics of the Ligai Soils

Typical profile

- 0 to 2 inches—reddish brown extremely flaggy very fine sandy loam
- 2 to 16 inches—reddish brown very flaggy sandy clay loam
- 16 to 25 inches—reddish brown extremely flaggy sandy clay loam
- 25 inches—diorite bedrock

Depth class: Moderately deep

Parent material: Colluvium and residuum derived from quartz diorite and sandstone

Drainage class: Well drained

Permeability: Moderate

Characteristics of the Pastorpeak Soils

Typical profile

- soil surface covered by 2 inches of fir needles, twigs, and cones
- 0 to 4 inches—dark reddish gray very cobbly very fine sandy loam
- 4 to 21 inches—reddish brown very cobbly loam

- 21 to 38 inches—reddish brown very cobbly loam
- 38 to 64 inches—reddish brown extremely cobbly sandy loam
- 64 to 80 inches—angular quartz diorite fragments, with some reddish brown sandy loam

Depth class: Very deep

Parent material: Colluvium and residuum derived from quartz diorite and sandstone

Drainage class: Well drained

Permeability: Moderate

Characteristics of the Arabrab Soils

Typical profile

- 0 to 2 inches—reddish brown extremely cobbly very fine sandy loam
- 2 to 11 inches—yellowish red gravelly sandy clay loam
- 11 to 15 inches—light reddish brown gravelly sandy clay loam
- 15 inches—sandstone bedrock

Depth class: Shallow

Parent material: Alluvium derived from sandstone and quartz diorite

Drainage class: Well drained

Permeability: Moderate

Characteristics of the Zibetod Soils

Typical profile

- 0 to 2 inches—dark brown extremely cobbly very fine sandy loam
- 2 to 9 inches—dark brown very cobbly very fine sandy loam
- 9 to 14 inches—brown very cobbly fine sandy loam
- 14 inches—sandstone bedrock

Depth class: Shallow

Parent material: Residuum, alluvium, and eolian material derived from sandstone, siltstone, and quartz diorite

Drainage class: Well drained

Permeability: Moderately rapid

Characteristics of the Bigpaw Soils

Typical profile

- 0 to 5 inches—dark brown loam
- 5 to 36 inches—dark reddish brown loam
- 36 to 48 inches—dark reddish gray loam
- 48 to 57 inches—reddish brown stony sandy clay loam
- 57 to 65 inches—light brown gravelly fine sandy loam

Depth class: Very deep

Parent material: Eolian material and alluvium derived from sandstone, siltstone, and quartz diorite

Drainage class: Well drained

Permeability: Moderate

Major Uses

Woodland production, livestock grazing, wildlife habitat

Management Concerns

- Access to this unit is restricted by moderate amounts of snow in winter and by soil wetness in early spring and late fall.
- Where density of the tree canopy exceeds 30 percent, understory vegetation for livestock grazing is limited.
- Maintaining the understory vegetation is essential in controlling erosion.
- The hazard of water erosion is severe on this unit.
- Overgrazing reduces available food and cover for wildlife species.
- This unit is moderately suited to production of coniferous trees.
- Woodlands of pinyon and juniper, and mixed-conifer forests provide habitat for many species.
- Fuelwood gatherers and wood cutters should leave nest trees and large nut producing pinyon trees.
- Rock outcrop supports little or no vegetation but is important for nest sites, resting cover, hunting perches, escape sites, and dens.
- Steep slopes and broken topography provide safety from danger for wildlife.

Wildlife Habitat

Types of wildlife habitat supported by this unit: woodland, grassland, Rock outcrop

Characteristic wildlife: mule deer, porcupine, black bear, wild turkey, pinyon jay, ladder-backed woodpecker, mourning dove, band-tailed pigeon, red-tailed hawk, golden eagle

Endangered species: peregrine falcon, Mexican spotted owl, black-footed ferret

Soils in a cold, subhumid climate in Major Land Resource Area 39

This group consists of two map units. It makes up about 7 percent of the survey area.

The average elevation is about 8,600 feet. The average annual precipitation is about 20 inches, the average annual air temperature is about 42 degrees F., and the average frost-free period is about 90 days. The vegetation is mainly ponderosa pine-Douglas-fir

forest, with an understory consisting of shrubs and cool-season grasses. Non-wooded areas occur in open valleys of the Chuska and Lukachukai Mountains, and are dominated either by moist grassland communities, or by hydrophytic plants in marsh communities. The major soils in this group generally have dark surfaces because of high organic matter content, are coarse textured to moderately fine textured, are nearly level to steeply sloping, and formed in materials derived from sandstone and basaltic rocks of Tertiary age.

This group is used for timber production, livestock grazing, and wildlife habitat. Major management concerns are steep rocky slopes, shallow soils, uncontrolled livestock grazing, and the hazard of water erosion.

14. Narbona-Yahmore-Kunz

Very deep, well drained soils on stable landslides, escarpments, and fan terraces

Composition

Narbona and similar soils: 32 percent
Yahmore and similar soils: 22 percent
Kunz and similar soils: 18 percent
Zilditloi and similar soils: 10 percent
Minor components: 18 percent

Minor Components

Tuntsa, Bostwick, and Canburn soils

Setting

Percent of survey area: 3

Location: The Chuska and Lukachukai Mountains in New Mexico and Arizona

Landform: **Narbona**—landslides; **Yahmore**—landslides and fan terraces; **Kunz**—landslides; **Zilditloi**—escarpments

Slope: **Narbona**—15 to 70 percent; **Yahmore**—1 to 15 percent; **Kunz**—5 to 45 percent; **Zilditloi**—60 to 90 percent

Present vegetation: Ponderosa pine and Douglas-fir forest with the following understory plants:

Narbona—earth sedge, nodding brome grass, bottlebrush squirreltail, and Gambel oak;

Yahmore—blue grama, bottlebrush squirreltail, pingue, and silvery lupine; **Kunz**—blue grama, bottlebrush squirreltail, Bailey yucca, and

Gambel oak; **Zilditloi**—Indian ricegrass, muttongrass, antelope bitterbrush, and Gambel oak

Elevation: 7,500 to 9,000 feet

Average annual precipitation: 16 to 20 inches

Average annual air temperature: 40 to 45 degrees F.

Frost-free period: 80 to 120 days

Characteristics of the Narbona Soils

Typical profile

- soil surface covered by 1 inch of pine needles, cones, and twigs
- 0 to 4 inches—brown very flaggy sand
- 4 to 22 inches—pinkish gray very channery sand
- 22 to 66 inches—yellowish red very stony sandy clay loam and very stony sandy loam

Depth class: Very deep

Parent material: Colluvium derived from sandstone

Drainage class: Well drained

Permeability: Rapid in upper part and moderate in lower part

Characteristics of the Yahmore Soils

Typical profile

- soil surface covered by 1 inch of pine needles, cones, and twigs
- 0 to 5 inches—brown fine sandy loam
- 5 to 33 inches—brown fine sandy loam
- 33 to 64 inches—reddish brown and yellowish red sandy clay loam

Depth class: Very deep

Parent material: Alluvium derived from sandstone and shale

Drainage class: Well drained

Permeability: Moderate

Characteristics of the Kunz Soils

Typical profile

- soil surface covered by 1 inch of pine needles, cones, and twigs
- 0 to 4 inches—dark brown very flaggy fine sandy loam
- 4 to 11 inches—reddish brown gravelly sandy clay loam
- 11 to 38 inches—yellowish red and very pale brown sandy clay loam and fine sandy loam
- 38 to 66 inches—reddish yellow sandy loam

Depth class: Very deep

Parent material: Colluvium derived from sandstone and shale

Drainage class: Well drained

Permeability: Moderate

Characteristics of the Zilditloi Soils

Typical profile

- 0 to 7 inches—brown loamy sand
- 7 to 70 inches—very pale brown sand

Depth class: Very deep

Parent material: Colluvium and residuum derived from sandstone

Drainage class: Excessively drained

Permeability: Rapid

Major Uses

Timber production, livestock grazing, wildlife habitat

Management Concerns

- Access to this unit is restricted by high amounts of snow in winter, and by soil wetness in early spring and late fall.
- This unit is well suited to production of coniferous trees.
- Steep slopes and large surface rock fragments on Narbona soils limit the use of wheeled equipment for tree harvesting.
- Where density of the tree canopy exceeds 30 percent, understory vegetation for livestock grazing is limited.
- Maintaining the understory vegetation is essential in controlling erosion.
- Intensive livestock grazing in forested areas conflicts with sustained timber production by inhibiting survival of tree seedlings and the growth of saplings.
- Livestock grazing conflicts with management for wildlife habitat by reducing available food and cover for wildlife species.
- Forests of ponderosa pine and mixed-conifers provide habitat for many species.
- Loggers should leave nest trees for wildlife.
- Steep slopes and broken topography provide safety from danger for wildlife.

Wildlife Habitat

Types of wildlife habitat supported by this unit: woodland, meadow

Characteristic wildlife: mule deer, black bear, wild turkey, golden eagle, long-tailed weasel, Chuska tassel-eared squirrel

Endangered species: peregrine falcon, Mexican spotted owl, black-footed ferret, bald eagle

15. Akhoni-Tunitcha-Bangston

Shallow to very deep, well drained to somewhat excessively drained soils on high plateaus, mesas, and structural benches

Composition

Akhoni and similar soils: 30 percent

Tunitcha and similar soils: 21 percent

Bangston and similar soils: 13 percent

Klizhin and similar soils: 12 percent

Bikeyah and similar soils: 8 percent

Minor components: 16 percent

Minor Components

Berland, Retaw, and Todacheene soils; Rock outcrop and Water

Setting

Percent of survey area: 4

Location: The Chuska and Lukachukai Mountains in New Mexico and Arizona

Landform: **Akhoni**—summits; **Tunitcha and Bangston**—backslopes; **Klizhin**—footslopes; **Bikeyah**—toeslopes

Slope: **Akhoni**—1 to 15 percent; **Tunitcha**—45 to 60 percent; **Bangston**—35 to 50 percent; **Klizhin**—10 to 35 percent; **Bikeyah**—1 to 15 percent

Present vegetation: **Akhoni, Tunitcha, and Klizhin**—ponderosa pine-Douglas-fir forest with an understory of Kentucky bluegrass, earth sedge, Oregon grape, and Gambel oak; **Bangston**—Douglas-fir-corkbark fir forest with understory of nodding brome grass, Kentucky bluegrass, Ross sedge, and mountain snowberry; **Bikeyah**—Kentucky bluegrass, smooth brome, timothy, and western yarrow

Elevation: 8,400 to 9,800 feet

Average annual precipitation: 20 to 24 inches

Average annual air temperature: 39 to 42 degrees F.

Frost-free period: 60 to 100 days

Characteristics of the Akhoni Soils

Typical profile

- soil surface covered by 1 inch of pine needles, cones, and twigs
- 0 to 3 inches—dark brown fine sandy loam
- 3 to 8 inches—dark brown fine sandy loam

- 8 to 17 inches—brown fine sandy loam
- 17 inches—sandstone bedrock

Depth class: Shallow

Parent material: Alluvium and residuum derived from sandstone

Drainage class: Well drained

Permeability: Moderately rapid

Characteristics of the Tunitcha Soils

Typical profile

- soil surface covered by 1 inch of pine needles, twigs, and cones
- 0 to 5 inches—dark grayish brown very flaggy sandy loam
- 5 to 8 inches—brown flaggy sandy loam
- 8 to 38 inches—reddish brown and brown sandy clay loam
- 38 to 57 inches—white and light brown sandy loam
- 57 inches—soft sandstone bedrock

Depth class: Deep

Parent material: Colluvium and residuum derived from sandstone

Drainage class: Well drained

Permeability: Moderate

Characteristics of the Bangston Soils

Typical profile

- soil surface covered by 1 inch of fir needles, cones, and twigs
- 0 to 7 inches—dark grayish brown loamy sand
- 7 to 16 inches—dark grayish brown loamy sand
- 16 to 26 inches—brown loamy sand
- 26 to 43 inches—brown flaggy loamy sand
- 43 to 66 inches—light yellowish brown very flaggy loamy sand

Depth class: Very deep

Parent material: Alluvium and colluvium derived from sandstone

Drainage class: Somewhat excessively drained

Permeability: Rapid

Characteristics of the Bikeyah Soils

Typical profile

- 0 to 14 inches—dark gray loam
- 14 to 29 inches—dark grayish brown and grayish brown fine sandy loam
- 29 to 65 inches—very pale brown and light gray sandy loam

Depth class: Very deep

Parent material: Alluvium derived from sandstone

Drainage class: Somewhat poorly drained

Permeability: Moderately rapid

Depth to seasonal high water table: 2.0 to 3.5 feet

Major Uses

Timber production, livestock grazing, wildlife habitat

Management Concerns

- Access to this unit is restricted by high amounts of snow in winter, and by soil wetness in early spring and late fall.
- This unit is well suited to production of coniferous trees.
- Windthrow is a potential problem on Akhoni soils during late winter and early spring months.
- Steep slopes and large surface rock fragments on Tunitcha soils limit the use of wheeled equipment for tree harvesting.
- Where density of the tree canopy exceeds 30 percent, understory vegetation for livestock grazing is limited.
- Maintaining the understory vegetation is essential in controlling erosion.
- Intensive livestock grazing in forested areas conflicts with sustained timber production by inhibiting survival of tree seedlings and the growth of saplings.
- Livestock grazing conflicts with management for wildlife habitat by reducing available food and cover for wildlife species.
- Forests of ponderosa pine and mixed-conifers provide habitat for many species.
- Loggers should leave nest trees for wildlife.
- Rock outcrop supports little or no vegetation but is important for nest sites, resting cover, hunting perches, escape sites, and dens.
- Steep slopes and broken topography provide safety from danger for wildlife.
- Wetlands provide important habitat for wildlife as well as flood protection, recreation opportunities, and water quality enhancement.

Wildlife Habitat

Types of wildlife habitat supported by this unit:

woodland, meadow, wetland, Rock outcrop

Characteristic wildlife: mule deer, black bear, wild turkey, golden eagle, long-tailed weasel, Chuska tassel-eared squirrel; in marshes are mallard, pintail, green-wing teal, blue-wing teal, coot, great blue heron, and beaver

Endangered species: peregrine falcon, Mexican spotted owl, black-footed ferret, bald eagle

Detailed Soil Map Units

A map unit is a collection of areas defined and named the same in terms of their major kinds of soil or miscellaneous areas or both. Each map unit differs in some respect from all others in a survey area and is uniquely identified on a soil map. Each identified area on the map is a delineation. The map unit delineations on the detailed soil maps spatially represent the soils or miscellaneous areas in this survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses. More information about each map unit is given under the heading "Use and Management of the Soils."

A map unit delineation represents an area dominated by one or more major kinds of soil or miscellaneous areas. These different kinds of soil or miscellaneous areas are considered components of the map unit. A map unit is identified and named according to the relative percentages of the dominant components. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some "included" components that belong to other taxonomic classes or are different miscellaneous land types.

Most included soil components have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are not contrasting and are called similar soils. These similar soils are not named in the map unit descriptions. Other included soils and miscellaneous areas, however, have properties and behavioral characteristics divergent enough to affect

use or to require different management. These are called contrasting inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of contrasting inclusions are identified by special symbols on the maps. The soils or miscellaneous areas considered contrasting inclusions are mentioned in the map unit descriptions. A contrasting inclusions may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of similar soils or contrasting inclusions in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, onsite investigation is needed to locate and define the soils and miscellaneous areas in more detail.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a soil series. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into soil phases. Some of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature

that affects use or management. For example, Mesa clay loam, wet, 0 to 1 percent slopes, is a phase of the Mesa series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes or associations.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on maps having a scale of 1 to 24,000. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Littlehat-Persayo-Nataani complex, 1 to 15 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Tunitcha-Bangston association, 35 to 60 percent slopes, is an example.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

Soil Descriptions

100—Werito loam, 1 to 3 percent slopes

Setting

Landform: Toeslopes below mesas, cuestras, and structural benches

Shape of areas: Irregular

Size of areas: 20 to 500 acres

Elevation: 5,400 to 6,000 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Werito soil and similar soils: 75 percent

Contrasting inclusions: 25 percent

Contrasting Inclusions

- The channery Genats soil on knolls
- The very deep Notal soil on fan terraces
- The frequently flooded Hamburn soil on narrow flood plains

Typical Profile

- 0 to 3 inches—brown loam
- 3 to 17 inches—pale brown clay loam
- 17 to 22 inches—grayish brown silty clay
- 22 to 34 inches—brown silty clay
- 34 inches—shale bedrock

Soil Properties and Qualities

Parent material: Alluvium and residuum derived from shale and sandstone

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Slow

Available water capacity: Low to moderate

Surface runoff: Medium

Hazard of water erosion: Moderate

Hazard of soil blowing: Severe

Salinity: Slightly saline below a depth of 17 inches

Sodicity: Moderately sodic below a depth of 7 inches

Major Uses

Livestock grazing

Dominant vegetation in potential plant community:

alkali sacaton, mound saltbush, ribscales, galleta, sickle saltbush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—500

Unfavorable years—300

Present plant community:

alkali sacaton, Russian-thistle, globemallow, mound saltbush, ribscales, sickle saltbush

Major limitations: hazard of soil blowing, hazard of water erosion

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating water facilities, properly distributing salt licks, and proper stocking.

- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: Nonirrigated—7s

Range site: Loamy Upland (sodic) 5-8" p.z.

102—Blackston-Camac-Rock outcrop complex, 0 to 60 percent slopes

Setting

Landform: High stream terraces

Position on the landform: **Blackston**—treads;

Camac—risers; **Rock outcrop**—cliffs

Slope: **Blackston**—0 to 2 percent; **Camac**—15 to 60 percent

Shape of areas: Irregular

Size of areas: 30 to 300 acres

Elevation: 4,600 to 5,100 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Blackston gravelly sandy loam and similar soils: 55 percent

Camac very cobbly fine sandy loam and similar soils: 20 percent

Rock outcrop: 15 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- The wet substratum Mesa soils on treads
- The non-gravelly Fruitland soil on fan terraces
- Blackston soils that have cobbly or stony surfaces on treads

Characteristics of the Blackston Soil

Typical profile:

- 0 to 3 inches—brown gravelly sandy loam
- 3 to 9 inches—light yellowish brown sandy loam
- 9 to 15 inches—pale brown gravelly sandy clay loam
- 15 to 35 inches—pale brown very gravelly coarse sandy loam
- 35 to 70 inches—pale brown and light brownish

gray very cobbly loamy coarse sand and very cobbly coarse sand

Parent material: Alluvium derived from sandstone, quartzite, and granite

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate in the upper layers and very rapid in the lower layers

Available water capacity: Very low to low

Water intake rate: Rapid

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Moderate

Salinity: Very slightly saline

Sodicity: Slightly sodic in the upper 15 inches

Corrosion potential: High for steel, moderate for concrete

Characteristics of the Camac Soil

Typical profile:

- 0 to 3 inches—brown very cobbly fine sandy loam
- 3 to 17 inches—light yellowish brown and pale brown gravelly loam
- 17 to 22 inches—grayish brown clay loam
- 22 to 31 inches—gray clay loam
- 31 inches—siltstone bedrock

Parent material: Alluvium derived from quartzite and residuum derived from siltstone and shale

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Moderately slow

Available water capacity: Very low to low

Surface runoff: Rapid

Hazard of water erosion: Moderate

Hazard of soil blowing: Moderate

Salinity: Slightly saline

Sodicity: Slightly sodic

Corrosion potential: High for steel, moderate for concrete

Characteristics of Rock outcrop

Rock outcrop consists of exposures of sandstone and siltstone bedrock. It occurs as cliffs and ledges intermixed with the Camac soil. There is little or no vegetation, and surface runoff is very rapid.

Major Uses

Urban development
Irrigated cropland and pasture
Livestock grazing

Urban development

Major limitations:

Blackston—hazard of soil blowing, very rapid permeability in the lower layers, unstable cutbanks, corrosivity

Camac—steep slopes, depth to bedrock, surface rock fragments, corrosivity, hazard of soil blowing

Suitable management practices and concerns:

- Excavation can expose soil material that is highly susceptible to wind erosion.
- Excavation increases the risk of water erosion.

Blackston soil

- This soil is a good source of roadfill.
- Preserve the existing plant cover during construction activities to reduce the risk of soil blowing.
- Effluent from septic tank absorption fields will not be filtered properly because of the very rapid permeability of the lower soil layers.
- If the density of housing is moderate to high, a community sewage system will be needed to prevent pollution of the ground water.
- Cutbanks are not stable and are subject to slumping.
- Design shallow excavations with sloping banks or shoring and bracing to prevent cutbanks from caving in.
- Provide an adequate wearing surface on roads to reduce the amount of dust and lower maintenance cost.
- Offset the risk of corrosion to uncoated steel and concrete by using corrosion-resistant material for foundations and underground utilities.

Camac soil

- Reduce the risk of erosion on steep cut and fill slopes by establishing a plant cover on them.

Irrigated cropland and pasture

Suitable crops:

Blackston—alfalfa for hay, fruits, melons, grasses, and legumes for pasture

Camac—none

Major limitations:

Blackston—hazard of soil blowing, rapid water intake rate, low water holding capacity

Camac—steep slopes, surface rock fragments, depth to bedrock

Suitable management practices and concerns:

Blackston soil

- Suitable irrigation systems are furrow, border, corrugation, and sprinkler.
- Land leveling is needed for uniform application of water with furrow, border, and corrugation methods.

- Use pipes, ditch linings, or drop structures in irrigation ditches to facilitate irrigation and reduce the risk of ditch erosion.

- Adjust applications of irrigation water to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

- Because the soil is droughty, light and frequent irrigation is recommended.

- All crops but legumes respond to nitrogen.

Legumes respond to phosphorus.

- Maintain tilth by returning crop residue to the soil, using legume mixtures, and using conservation tillage methods.

- Maintain the quality and quantity of forage by rotating grazing, mowing and clipping, controlling weeds, and fertilizing.

- Reduce the hazard of soil blowing by planting field windbreaks and maintaining a plant cover.

Livestock grazing

Blackston soil

Dominant vegetation in potential plant community:

Indian ricegrass, galleta, bottlebrush squirreltail, sand dropseed, shadscale

Annual production of air-dry vegetation (pounds per acre):

Favorable years—550

Unfavorable years—350

Present plant community: cheatgrass, galleta, Indian ricegrass, sand dropseed, Russian-thistle, broom snakeweed, shadscale

Camac soil

Dominant vegetation in potential plant community:

galleta, Indian ricegrass, Castle Valley clover, shadscale, alkali sacaton, sand dropseed, bud sagebrush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—450

Unfavorable years—250

Present plant community:

cheatgrass, galleta, Indian ricegrass, shadscale, Castle Valley clover

Major limitations:

Blackston—soil blowing hazard

Camac—surface rock fragments, steep slopes, hazard of soil blowing, hazard of water erosion

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.

- Suitability for range seeding is poor because of climate and soil factors.

- Livestock prefer to graze the easily accessible forage on terrace tread and in valleys before they graze steep slopes.
- Promote uniform grazing by fencing, properly locating watering facilities, and proper stocking.
- Vary the season of grazing and the periods of rest during successive years.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Windbreaks and Environmental Plantings

Blackston soil

- Windbreaks are needed to limit soil losses, maintain optimum crop yields, protect farm and ranch buildings, and provide cover for wildlife.
- The trees and shrubs selected for planting should be suited to the conditions of the site.
- Irrigation should be provided for the establishment and maintenance of windbreaks.

Interpretive Groups

Land capability classification: **Blackston**—nonirrigated—7c, irrigated—4e; **Camac**—nonirrigated—7e, **Rock outcrop**—nonirrigated—8s

Range site: **Blackston**—Sandy Loam Upland (gravelly) 5-8" p.z.; **Camac**—Cobbly Slopes 5-8" p.z.; **Rock outcrop**—Not assigned

105—Hamburn clay loam, 0 to 1 percent slopes

Setting

Landform: Braided flood plains

Shape of areas: Irregular

Size of areas: 50 to 1,000 acres

Elevation: 5,200 to 6,000 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Hamburn soil and similar soils: 80 percent

Contrasting inclusions: 20 percent

Contrasting Inclusions

- The moderately coarse textured Jeddito soil on low stream terraces
- The fine textured Notal soil on small depressions

Typical Profile

- 0 to 3 inches—pale brown clay loam
- 3 to 9 inches—pale brown sandy clay loam
- 9 to 24 inches—pale brown and brown sandy clay loam
- 24 to 70 inches—pale brown and yellowish brown clay loam and silty clay loam

Soil Properties and Qualities

Parent material: Alluvium derived from sandstone and shale

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately slow

Available water capacity: Low to moderate

Surface runoff: Slow

Hazard of water erosion: Very slight

Hazard of soil blowing: Severe

Flooding frequency: Frequent, very brief periods

Salinity: Strongly saline below a depth of 33 inches

Sodicity: Strongly sodic below a depth of 33 inches

Major Uses

Livestock grazing

Dominant vegetation in potential plant community: alkali sacaton, galleta, bottlebrush squirreltail, mound saltbush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—2,500

Unfavorable years—800

Present plant community:

alkali sacaton, galleta, mound saltbush

Major limitations: hazard of soil blowing, hazard of water erosion, flooding

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.
- Range seeding may be needed if the better forage plants have decreased.

- Suitability for range seeding is fair because of climate factors.
- Seed the range if the plant cover is not sufficient to protect the soil from erosion.
- Seed suitable plants. Among these are salt-tolerant species such as alkali sacaton and galleta.
- Seed late in the fall for best results.
- After seeding, defer grazing until the young plants are well established.

Interpretive Groups

Land capability classification: Nonirrigated—6s

Range site: Saline Bottom 5-8" p.z.

107—Tocito-Gullied land complex, 1 to 3 percent slopes

Setting

Landform: Low stream terraces

Shape of areas: Irregular

Size of areas: 50 to 1,100 acres

Elevation: 4,900 to 5,300 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Tocito very fine sandy loam and similar soils: 55 percent

Gullied land: 30 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The occasionally flooded Ravola soil on narrow flood plains along the margins of valley floors
- Riverwash in wash channels
- The medium textured Tsebitai soil throughout the unit south of the San Juan River

Characteristics of the Tocito Soil

Typical profile:

- 0 to 2 inches—pale brown very fine sandy loam
- 2 to 16 inches—pale brown loam
- 16 to 63 inches—pale brown stratified very fine sandy loam to silt loam

Parent material: Alluvium derived from siltstone

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: High

Surface runoff: Medium

Hazard of water erosion: Moderate

Hazard of soil blowing: Severe

Flooding frequency: Rare

Salinity: Slightly saline below a depth of 34 inches

Characteristics of Gullied Land

Gullied land consists of steep, barren, silty alluvium which occupies dissected portions of low stream terraces. There is little or no vegetation, and surface runoff is rapid to very rapid.

Major Uses

Livestock grazing

Dominant vegetation in potential plant community:

alkali sacaton, galleta, mound saltbush, bottlebrush squirreltail

Annual production of air-dry vegetation (pounds per acre):

Favorable years—600

Unfavorable years—400

Present plant community:

annual wheatgrass, alkali sacaton, Russian-thistle, mound saltbush, Castle Valley clover

Major limitations: hazard of soil blowing, hazard of water erosion

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, and proper stocking.
- Control the time and amount of use by livestock.
- Manage the range to control gully, streambank cutting, and sheet erosion.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Tocito**—nonirrigated—7c, irrigated—3e; **Gullied land**—nonirrigated—8s

Range site: **Tocito**—Clay Loam Terrace (sodic) 5-8" p.z.; **Gullied land**—not assigned

110—Brimhall-Benally-Genats association, 0 to 45 percent slopes

Setting

Landform: Plateaus, mesas, and structural benches

Position on the landform: **Brimhall**—knolls;

Benally—toeslopes and summits; **Genats**—footslopes and backslopes

Slope: **Brimhall**—1 to 3 percent; **Benally**—0 to 2 percent; **Genats**—15 to 45 percent

Shape of areas: Irregular

Size of areas: 20 to 1,500 acres

Elevation: 5,500 to 5,800 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Brimhall loamy fine sand and similar soils: 35 percent

Benally sandy clay loam and similar soils: 25 percent

Genats channery loamy fine sand and similar soils: 15 percent

Contrasting inclusions: 25 percent

Contrasting Inclusions:

- The shallow Chipeta soil on slopes of 5 to 15 percent
- Rock outcrop of sandstone on shoulders of hills
- Badland on barren shale slopes

Characteristics of the Brimhall Soil

Typical profile:

- 0 to 2 inches—yellowish brown loamy fine sand
- 2 to 21 inches—light yellowish brown and very pale brown fine sandy loam
- 21 to 29 inches—white fine sandy loam
- 29 to 49 inches—white and very pale brown gypsiferous material which is an apparent fine sandy loam and channery fine sandy loam
- 49 inches—soft sandstone bedrock

Parent material: Eolian material, alluvium, and residuum derived from sandstone

Depth class: Deep

Drainage class: Well drained

Permeability: Moderately rapid

Available water capacity: Low to moderate

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Very severe

Salinity: Moderately saline below a depth of 38 inches

Sodicity: Moderately sodic below a depth of 38 inches

Characteristics of the Benally Soil

Typical profile:

- 0 to 1 inch—brown sandy clay loam
- 1 to 11 inches—light brown clay loam
- 11 to 31 inches—light yellowish brown clay loam

- 31 to 52 inches—very pale brown channery sandy clay loam
- 52 inches—soft sandstone bedrock

Parent material: Alluvium and residuum derived from sandstone and shale

Depth class: Deep

Drainage class: Well drained

Permeability: Moderately slow

Available water capacity: Low to moderate

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Moderate

Salinity: Moderately saline below a depth of 11 inches

Sodicity: Strongly sodic below a depth of 1 inch

Characteristics of the Genats Soil

Typical profile:

- 0 to 4 inches—light brown channery loamy fine sand
- 4 to 13 inches—light brownish gray clay and silty clay
- 13 to 27 inches—light yellowish brown and pinkish gray silty clay
- 27 inches—shale bedrock

Parent material: Alluvium and residuum derived from shale

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Slow

Available water capacity: Very low

Surface runoff: Rapid

Hazard of water erosion: Severe

Hazard of soil blowing: Severe

Salinity: Moderately saline below a depth of 13 inches

Sodicity: Moderately sodic below a depth of 4 inches

Major Uses

Livestock grazing

Brimhall soil

Dominant vegetation in potential plant community: alkali sacaton, galleta, Indian ricegrass, shadscale, winterfat

Annual production of air-dry vegetation (pounds per acre):

Favorable years—550

Unfavorable years—350

Present plant community:

alkali sacaton, galleta, Indian ricegrass, shadscale, winterfat, Russian-thistle

Benally soil

Dominant vegetation in potential plant community:

alkali sacaton, ribscale, mound saltbush, galleta,
Indian ricegrass

Annual production of air-dry vegetation (pounds per acre):

Favorable years—500

Unfavorable years—300

Present plant community:

alkali sacaton, galleta, mound saltbush, Russian-thistle, ribscale

Genats soil

Dominant vegetation in potential plant community:

alkali sacaton, shadscale, sickle saltbush, galleta,
Indian ricegrass, mound saltbush, sand dropseed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—300

Unfavorable years—150

Present plant community:

alkali sacaton, galleta, mound saltbush, shadscale,
sickle saltbush, Russian-thistle

Major limitations:

Brimhall—hazard of soil blowing

Benally—hazard of soil blowing

Genats—hazard of water erosion, hazard of soil blowing, steep slopes

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.

Genats soil

- Uniform distribution of grazing is difficult because of the slope or the lack of permanent water developments, or both.
- Livestock prefer to graze the easily accessible areas before they graze the steep slopes.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Vary the season of grazing and the periods of rest during successive years.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Brimhall**—

nonirrigated—7c; **Benally**—nonirrigated—7c;

Genats—nonirrigated—7e

Range site: **Brimhall**—Sandy Loam Upland (saline)

5-8" p.z.; **Benally**—Loamy Upland (sodic) 5-8" p.z.; **Genats**—Breaks 5-8" p.z.

113—Gyptur very fine sandy loam, 0 to 3 percent slopes

Setting

Landform: Toeslopes of undulating plateaus

Shape of areas: Irregular

Size of areas: 20 to 1,000 acres

Elevation: 5,000 to 5,600 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Gyptur soil and similar soils: 85 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The very deep, slowly permeable Hoskay soil on fan terraces
- The moderately deep Littlehat soil on footslopes
- The occasionally flooded Ravola soil on narrow flood plains

Typical Profile

- 0 to 2 inches—light yellowish brown very fine sandy loam
- 2 to 5 inches—brown silty clay loam
- 5 to 17 inches—light brownish gray gypsiferous material which is an apparent loam
- 17 to 46 inches—light brownish gray loam
- 46 inches—siltstone bedrock

Soil Properties and Qualities

Parent material: Alluvium and residuum derived from siltstone

Depth class: Deep

Drainage class: Well drained

Permeability: Moderately slow

Available water capacity: Very low to low

Surface runoff: Medium

Hazard of water erosion: Moderate

Hazard of soil blowing: Severe

Salinity: Strongly saline below a depth of 26 inches

Sodicity: Strongly sodic below a depth of 26 inches

Major Uses

Livestock grazing

Dominant vegetation in potential plant community:

Indian ricegrass, alkali sacaton, galleta, Castle Valley clover, sickle saltbush, mat saltbush, bud sagebrush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—500

Unfavorable years—300

Present plant community:

Indian ricegrass, alkali sacaton, galleta, cheatgrass, Castle Valley clover, mat saltbush, sickle saltbush, bud sagebrush

Major limitations: hazard of soil blowing, hazard of water erosion

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: Nonirrigated—7s

Range site: Silty Upland (sodic) 5-8" p.z.

115—Denazar-Farb fine sands, 0 to 3 percent slopes

Setting

Landform: Undulating plateaus and structural benches

Position on the landform: **Denazar**—eolian-mantled summits; **Farb**—summits

Slope: **Denazar**—0 to 3 percent; **Farb**—1 to 3 percent

Shape of areas: Irregular

Size of areas: 800 to 10,000 acres

Elevation: 5,400 to 5,900 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Denazar soil and similar soils: 60 percent

Farb soil and similar soils: 25 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- Small areas of sandstone rock outcrop occurring as exposed bedding planes and small cliffs 25 to 50 feet high
- Duneland east and north of the Chaco River
- The moderately fine textured Kimbeto soil in stable, low areas

Characteristics of the Denazar Soil

Typical profile:

- 0 to 14 inches—yellowish brown fine sand
- 14 to 31 inches—very pale brown and light yellowish brown loamy fine sand
- 31 to 42 inches—brownish yellow fine sand
- 42 inches—soft sandstone bedrock

Parent material: Eolian material and residuum derived from sandstone

Depth class: Deep

Drainage class: Somewhat excessively drained

Permeability: Rapid

Available water capacity: Very low

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Very severe

Characteristics of the Farb Soil

Typical profile:

- 0 to 6 inches—brown fine sand
- 6 to 10 inches—strong brown channery fine sandy loam
- 10 inches—sandstone bedrock

Parent material: Eolian material and residuum derived from sandstone

Depth class: Very shallow

Drainage class: Well drained

Permeability: Moderately rapid

Available water capacity: Very low

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Very severe

Major Uses

Livestock grazing

Denazar soil

Dominant vegetation in potential plant community:

Indian ricegrass, sand Mormon tea, galleta, sand dropseed, sandhill muhly, fourwing saltbush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—500

Unfavorable years—250

Present plant community:

Indian ricegrass, galleta, sand Mormon tea, fourwing saltbush, annual forbs

Farb soil*Dominant vegetation in potential plant community:*

Indian ricegrass, galleta, Bigelow sagebrush, New Mexico feathergrass, blue grama, bottlebrush squirreltail, Torrey Mormon tea, broom snakeweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—200

Unfavorable years—100

Present plant community:

Indian ricegrass, galleta, alkali sacaton, Bigelow sagebrush, broom snakeweed

Major limitations:

Denazar—hazard of soil blowing

Farb—hazard of soil blowing, depth to bedrock

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly location watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Denazar**—

nonirrigated—7c; **Farb**—nonirrigated—7s

Range site: **Denazar**—Sandy Upland 5-8" p.z.;

Farb—Sandstone Upland 5-8" p.z.

117—Badland-Rock outcrop complex**Setting**

Landform: Escarpments of plateaus, mesas, and buttes; scarp faces of hogbacks

Shape of areas: Irregular

Size of areas: 50 to 500 acres

Elevation: 4,900 to 6,500 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Badland: 75 percent

Rock outcrop: 15 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- The shallow Chipeta and Persayo soils on footslopes
- The occasionally flooded Ravola soil on small flood plains and alluvial fans
- The very shallow Farb soil on summits of buttes

Characteristics of Badland

Badland consists of exposures of barren siltstone and shale bedrock. It occurs as steep, convex cones below rock outcrop. There is little or no vegetation, and surface runoff is rapid.

Characteristics of Rock outcrop

Rock outcrop consists of exposures of sandstone bedrock. It occurs as vertical cliffs and ledges above areas of badland. There is little or no vegetation, and surface runoff is very rapid.

Major Uses**Wildlife habitat**

Badland component: Badland is very poorly suited to production of herbaceous plants and shrubs. However, the steep slopes and broken topography provide den areas and cover for wildlife.

Rock outcrop component: Rock outcrop grows no vegetation, but is important for birds and bats. The cliffs provide nest and roost sites, hunting perches, and safety from danger for several raptor species. The ledges also provide resting cover, den areas, and safety from danger for other wildlife species.

Interpretive Groups

Land capability classification: **Badland**—

nonirrigated—8s; **Rock outcrop**—nonirrigated—8s

Range site: **Badland**—not assigned; **Rock outcrop**—not assigned

120—Nageezi-Denazar association, 1 to 8 percent slopes**Setting**

Landform: High stream terraces

Position on the landform: **Nageezi**—treads;

Denazar—eolian-mantled treads

Slope: **Nageezi**—1 to 8 percent; **Denazar**—1 to 5 percent slopes

Shape of areas: Irregular

Size of areas: 150 to 3,000 acres

Elevation: 5,400 to 5,900 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Nageezi loamy fine sand and similar soils: 45 percent

Denazar fine sand and similar soils: 35 percent

Contrasting inclusions: 20 percent

Contrasting Inclusions

- The moderately fine textured Mack soil in small depressions
- The rapidly permeable Razito soil on stable dunes

Characteristics of the Nageezi Soil

Typical profile:

- 0 to 4 inches—brown loamy fine sand
- 4 to 14 inches—brown fine sandy loam
- 14 to 32 inches—light brown and pinkish white fine sandy loam and loam
- 32 to 48 inches—very pale brown fine sandy loam
- 48 to 64 inches—very pale brown and light yellowish brown loamy sand and loamy coarse sand

Parent material: Alluvium and eolian material derived from sandstone

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately rapid

Available water capacity: Moderate

Surface runoff: Slow

Hazard of water erosion: Moderate

Hazard of soil blowing: Very severe

Salinity: Slightly saline below a depth of 32 inches

Sodicity: Slightly sodic below a depth of 24 inches

Characteristics of the Denazar Soil

Typical profile:

- 0 to 11 inches—light brown fine sand
- 11 to 34 inches—light brown loamy fine sand and loamy sand
- 34 to 62 inches—pink and pinkish gray sandy loam and loamy sand

Parent material: Alluvium and eolian material derived from sandstone

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Moderately rapid

Available water capacity: Low to moderate

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Very severe

Major Uses

Livestock grazing

Nageezi soil

Dominant vegetation in potential plant community:

Indian ricegrass, galleta, sand dropseed, bottlebrush squirreltail, winterfat, fourwing saltbush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—550

Unfavorable years—300

Present plant community:

Indian ricegrass, galleta, Fendler threeawn, broom snakeweed, winterfat, fourwing saltbush

Denazar soil

Dominant vegetation in potential plant community:

Indian ricegrass, sand Mormon tea, galleta, sand dropseed, sandhill muhly, fourwing saltbush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—500

Unfavorable years—250

Present plant community:

Indian ricegrass, sandhill muhly, sand Mormon tea, mesa dropseed, galleta, Fendler threeawn

Major limitations: hazard of soil blowing

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Nageezi**—

nonirrigated—7c; **Denazar**—nonirrigated—7c

Range site: **Nageezi**—Sandy Loam Upland 5-8" p.z.;

Denazar—Sandy Upland 5-8" p.z.

122—Blueflat-Notal association, 2 to 10 percent slopes

Setting

Landform: Toeslopes, footslopes, and low fan terraces below mesas and cuestas

Position on the landform: **Blueflat**—toeslopes and footslopes; **Notal**—low fan terraces

Slope: **Blueflat**—2 to 10 percent; **Notal**—2 to 5 percent

Shape of areas: Irregular

Size of areas: 100 to 2,000 acres

Elevation: 4,700 to 6,100 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Blueflat loam and similar soils: 55 percent

Notal clay loam and similar soils: 30 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The shallow Chipeta soil on footslopes and knolls
- Badland on barren shale hills
- The occasionally flooded Ravola soil on alluvial fans and narrow flood plains

Characteristics of the Blueflat Soil

Typical profile:

- 0 to 2 inches—brown loam
- 2 to 7 inches—brown clay loam
- 7 to 14 inches—light brownish gray gypsiferous material which is an apparent silty clay loam
- 14 to 27 inches—grayish brown silty clay loam
- 27 inches—shale bedrock

Parent material: Alluvium and residuum derived from shale

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Slow

Available water capacity: Very low

Surface runoff: Medium

Hazard of water erosion: Moderate

Hazard of soil blowing: Severe

Salinity: Moderately saline between 14 and 17 inches

Sodicity: Moderately sodic between 14 and 27 inches

Characteristics of the Notal Soil

Typical profile:

- 0 to 3 inches—brown clay loam
- 3 to 13 inches—brown silty clay loam

- 13 to 70 inches—brown and grayish brown silty clay loam and silty clay

Parent material: Alluvium derived from shale and siltstone

Depth class: Very deep

Drainage class: Well drained

Permeability: Very slow

Available water capacity: Moderate to high

Surface runoff: Medium

Hazard of water erosion: Moderate

Hazard of soil blowing: Severe

Flooding frequency: Rare

Salinity: Moderately saline between 13 and 70 inches

Sodicity: Moderately sodic between 13 and 70 inches

Major Uses

Livestock grazing

Blueflat soil

Dominant vegetation in potential plant community:

alkali sacaton, mound saltbush, ribscale, galleta, Indian ricegrass, sickle saltbush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—500

Unfavorable years—300

Present plant community:

galleta, alkali sacaton, mound saltbush, Russian-thistle

Notal soil

Dominant vegetation in potential plant community:

alkali sacaton, mound saltbush, galleta, black greasewood

Annual production of air-dry vegetation (pounds per acre):

Favorable years—600

Unfavorable years—400

Present plant community:

alkali sacaton, mound saltbush, ribscale, Russian-thistle

Major limitations: hazard of soil blowing, hazard of water erosion

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, and proper stocking.
- Control the time and amount of use by livestock.

- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Blueflat**—nonirrigated—7c; **Notal**—nonirrigated—7c, irrigated—3s

Range site: **Blueflat**—Loamy Upland (sodic) 5-8" p.z.; **Notal**—Clay Loam Terrace (sodic) 5-8" p.z.

125—Kimbeto loamy fine sand, 0 to 4 percent slopes

Setting

Landform: Summits of plateaus and structural benches

Shape of areas: Irregular

Size of areas: 50 to 5,000 acres

Elevation: 5,400 to 5,900 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Kimbeto soil and similar soils: 80 percent

Contrasting inclusions: 20 percent

Contrasting Inclusions

- The strongly sodic Benally soil on toeslopes between Sheep Springs Wash and Captain Tom Wash
- Rock outcrop of sandstone occurring as exposed bedding planes on small knolls
- The very shallow Farb soil adjacent to rock outcrops
- The coarse textured Denazar soil on hummocky areas between Hunter Wash and the Chaco River

Typical Profile

- 0 to 3 inches—light brown loamy fine sand
- 3 to 10 inches—light brown fine sandy loam
- 10 to 18 inches—brown sandy clay loam
- 18 to 29 inches—very pale brown and white fine sandy loam
- 29 to 42 inches—brownish yellow loamy fine sand
- 42 inches—soft sandstone bedrock

Soil Properties and Qualities

Parent material: Eolian material, alluvium, and residuum derived from sandstone

Depth class: Deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Low to moderate

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Very severe

Salinity: Moderately saline below a depth of 29 inches

Sodicity: Moderately sodic below a depth of 22 inches

Major Uses

Livestock grazing

Dominant vegetation in potential plant community:

alkali sacaton, Indian ricegrass, shadscale, galleta

Annual production of air-dry vegetation (pounds per acre):

Favorable years—550

Unfavorable years—350

Present plant community:

alkali sacaton, galleta, Indian ricegrass, shadscale

Major limitations: hazard of soil blowing

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: Nonirrigated—7c

Range site: Sandy Loam Upland (saline) 5-8" p.z.

130—Badland-Genats complex, 35 to 60 percent slopes

Setting

Landform: Escarpments of mesas, cuevas, and hogbacks

Position on the landform: **Badland**—backslopes;

Genats—backslopes and footslopes

Shape of areas: Irregular

Size of areas: 250 to 1,500 acres

Elevation: 5,300 to 6,000 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 140 to 160 days

Composition

Badland: 40 percent
 Genats channery silt loam and similar soils: 35 percent
 Contrasting inclusions: 25 percent

Contrasting Inclusions

- Rock outcrop of sandstone occurring as exposed ledges and cliffs
- The deep Brimhall soil on knolls east of Newcomb
- The very shallow Farb soil on structural benches

Characteristics of Badland

Badland consists of exposures of barren shale bedrock. It occurs as steep, convex cones above and below the Genats soil. There is little or no vegetation, and surface runoff is rapid.

Characteristics of the Genats Soil

Typical profile:

- 0 to 3 inches—brown channery silt loam
- 3 to 9 inches—brown silty clay loam
- 9 to 22 inches—yellowish brown silty clay loam
- 22 inches—shale bedrock

Parent material: Alluvium and residuum derived from shale

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Slow

Available water capacity: Very low

Surface runoff: Rapid

Hazard of water erosion: Very severe

Hazard of soil blowing: Severe

Salinity: Moderately saline below a depth of 15 inches

Sodicity: Moderately sodic below a depth of 3 inches

Major Uses

Livestock grazing

Genats soil

Dominant vegetation in potential plant community: alkali sacaton, shadscale, sickle saltbush, galleta, Indian ricegrass, mound saltbush, sand dropseed
Annual production of air-dry vegetation (pounds per acre):

Favorable years—300

Unfavorable years—150

Present plant community:

alkali sacaton, galleta, Indian ricegrass, shadscale, sickle saltbush, Russian-thistle

Major limitations: hazard of water erosion, hazard of soil blowing, steep slopes

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Uniform distribution of grazing is difficult because of the slope or the lack of permanent water developments, or both.
- Livestock prefer to graze the easily accessible areas before they graze the steep slopes.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Vary the season of grazing and the periods of rest during successive years.
- Control the time and amount of use by livestock.
- Reduce the risk of water erosion and soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Genats**—

nonirrigated—7e; **Badland**—nonirrigated—8s

Range site: **Genats**—Breaks 5-8" p.z.; **Badland**—not assigned

133—Razito sand, 1 to 6 percent slopes

Setting

Landform: Stable dunes on undulating plateaus

Shape of areas: Irregular

Size of areas: 20 to 700 acres

Elevation: 4,700 to 5,300 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Razito soil and similar soils: 85 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The moderately coarse textured Nageezi soil on lower areas throughout the unit
- The moderately fine textured Gyptur and Kimbeto soils on sodium-affected areas between stable linear dunes

Typical Profile

- 0 to 10 inches—light yellowish brown sand
- 10 to 70 inches—light yellowish brown loamy sand

Soil Properties and Qualities

Parent material: Eolian material derived from sandstone

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Rapid

Available water capacity: Low

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Very severe

Major Uses

Livestock grazing

Dominant vegetation in potential plant community:

Indian ricegrass, blue grama, sand dropseed, sandhill muhly, mesa dropseed, galleta, fourwing saltbush, broom snakeweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—500

Unfavorable years—250

Present plant community:

Indian ricegrass, sandhill muhly, mesa dropseed, cheatgrass, broom snakeweed, fourwing saltbush, spike dropseed

Major limitations: hazard of soil blowing

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: Nonirrigated—7c, irrigated—4s

Range site: Sandy Upland 5-8" p.z.

135—Farb-Rock outcrop-Badland complex, 2 to 25 percent slopes

Setting

Landform: Structural benches, mesas, and cuestas (fig. 5)

Position on the landform: **Farb**—summits and dipslopes; **Rock outcrop**—cliffs and slickrock; **Badland**—backslopes

Shape of areas: Irregular

Size of areas: 30 to 1,000 acres

Elevation: 4,900 to 5,900 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Farb channery loamy fine sand and similar soils: 50 percent

Rock outcrop: 25 percent

Badland: 15 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- The fine textured Genats and Chipeta soils on knolls below areas of badland
- The deep Denazar soil on eolian-mantled areas north of the Chaco River
- The shallow Persayo soil on knolls of Table Mesa and the Tocito Dome
- Farb soils on slopes of 25 to 60 percent on dipslopes of Rock Ridge and The Hogback

Characteristics of the Farb Soil

Typical profile:

- 0 to 2 inches—pale brown channery loamy fine sand
- 2 to 5 inches—very pale brown fine sandy loam
- 5 to 8 inches—very pale brown channery fine sandy loam
- 8 inches—sandstone bedrock

Parent material: Alluvium and residuum derived from sandstone

Depth class: Very shallow

Drainage class: Well drained

Permeability: Moderately rapid

Available water capacity: Very low

Surface runoff: Rapid

Hazard of water erosion: Moderate

Hazard of soil blowing: Severe



Figure 5.—A typical area of Farb-Rock outcrop-Badland complex, 2 to 25 percent slopes, near the Great Bend of the Chaco River in New Mexico. Indian ricegrass and Bigelow sagebrush are common plants growing on the very shallow Farb soil.

Characteristics of Rock outcrop

Rock outcrop consists of exposures of sandstone bedrock. It occurs as gently to moderately sloping slickrock, and as steeply sloping to vertical cliffs and ledges intermixed with badland and the Farb soil. There is little or no vegetation, and surface runoff is rapid to very rapid.

Characteristics of Badland

Badland consists of exposures of barren shale bedrock. It occurs as steep, convex cones intermixed with Rock outcrop and the Farb soil. There is little or no vegetation, and surface runoff is rapid.

Major Uses

Livestock grazing

Dominant vegetation in potential plant community:

Indian ricegrass, galleta, Bigelow sagebrush, New Mexico feathergrass, blue grama, bottlebrush squirreltail, Torrey Mormon tea, broom snakeweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—200

Unfavorable years—100

Present plant community:

Indian ricegrass, sand dropseed, Torrey Mormon tea, alkali sacaton, galleta, shadscale, Bigelow sagebrush, broom snakeweed

Major limitations: hazard of soil blowing, hazard of water erosion, depth to bedrock, presence of rock outcrops

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.

- Suitability for range seeding is poor because of climate and soil factors.
- Uniform distribution of grazing is difficult because of the slope or the lack of permanent water developments, or both.
- Livestock prefer to graze the easily accessible areas before they graze the steep slopes.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Vary the season of grazing and the periods of rest during successive years.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Farb**—nonirrigated—7s; **Rock outcrop**—nonirrigated—8s; **Badland**—nonirrigated—8s

Range site: **Farb**—Sandstone Upland 5-8" p.z.; **Rock outcrop**—not assigned; **Badland**—not assigned

137—Persayo-Cairn-Patel complex, 1 to 25 percent slopes

Setting

Landform: Structural benches and cuestas

Position on the landform: **Persayo**—toeslopes, footslopes, and dipslopes; **Cairn**—summits and dipslopes; **Patel**—backslopes and scarp faces

Slope: **Persayo**—1 to 15 percent; **Cairn**—1 to 5 percent; **Patel**—5 to 25 percent

Shape of areas: Irregular

Size of areas: 200 to 5,000 acres

Elevation: 4,900 to 5,400 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Persayo loam and similar soils: 35 percent

Cairn channery fine sandy loam and similar soils: 30 percent

Patel channery loam and similar soils: 25 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- The strongly sodic Littlehat soil on saline areas near Persayo soils

- The fine textured Genats soil on footslopes and backslopes
- Shale badland on eroded backslopes
- The moderately coarse textured Brimhall and Nageezi soils in small eolian-mantled areas

Characteristics of the Persayo Soil

Typical profile:

- 0 to 2 inches—pale brown loam
- 2 to 17 inches—light brownish gray and light yellowish brown silty clay loam and clay loam
- 17 inches—interbedded shale and siltstone bedrock

Parent material: Alluvium and residuum derived from shale and siltstone

Depth class: Shallow

Drainage class: Well drained

Permeability: Moderately slow

Available water capacity: Very low

Surface runoff: Medium

Hazard of water erosion: Very severe

Hazard of soil blowing: Severe

Salinity: Slightly saline

Sodicity: Slightly sodic

Characteristics of the Cairn Soil

Typical profile:

- 0 to 2 inches—light brown channery fine sandy loam
- 2 to 9 inches—brown loam
- 9 to 19 inches—very pale brown very channery loam
- 19 to 46 inches—very pale brown and light yellowish brown gypsiferous material which is an apparent extremely flaggy coarse sandy loam and extremely channery coarse sandy loam
- 46 inches—soft sandstone and limestone bedrock

Parent material: Residuum derived from sandstone and limestone

Depth class: Deep

Drainage class: Well drained

Permeability: Moderate in the upper 19 inches

Available water capacity: Very low to low

Surface runoff: Medium

Hazard of water erosion: Slight

Hazard of soil blowing: Severe

Salinity: Slightly saline between 30 and 46 inches

Sodicity: Slightly sodic between 9 and 19 inches

Characteristics of the Patel Soil

Typical profile:

- 0 to 1 inch—light brown very channery loam
- 1 to 8 inches—brown clay

- 8 to 24 inches—yellowish brown and grayish brown silty clay loam
- 24 to 37 inches—very pale brown and light yellowish brown gypsiferous material which is an apparent clay loam
- 37 inches—interbedded shale and soft limestone bedrock

Parent material: Alluvium and residuum derived from shale, siltstone, and limestone

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Slow

Available water capacity: Low

Surface runoff: Rapid

Hazard of water erosion: Moderate

Hazard of soil blowing: Severe

Salinity: Moderately saline between 8 and 37 inches

Sodicity: Moderately sodic between 1 inch and 37 inches

Major Uses

Livestock grazing

Persayo soil

Dominant vegetation in potential plant community:

Castle Valley clover, Indian ricegrass, galleta, bud sagebrush, bottlebrush squirreltail

Annual production of air-dry vegetation (pounds per acre):

Favorable years—350

Unfavorable years—150

Present plant community:

Castle Valley clover, Indian ricegrass, galleta, cheatgrass, bud sagebrush

Cairn soil

Dominant vegetation in potential plant community:

Indian ricegrass, shadscale, galleta, bottlebrush, squirreltail, sand dropseed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—550

Unfavorable years—350

Present plant community:

galleta, Indian ricegrass, sand dropseed, cheatgrass, shadscale, broom snakeweed

Patel soil

Dominant vegetation in potential plant community:

Indian ricegrass, Castle Valley clover, galleta, alkali sacaton, bottlebrush squirreltail, shadscale

Annual production of air-dry vegetation (pounds per acre):

Favorable years—500

Unfavorable years—300

Present plant community:

galleta, Indian ricegrass, cheatgrass, alkali sacaton, Castle Valley clover, shadscale

Major limitations: hazard of soil blowing, hazard of water erosion

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Persayo**—

nonirrigated—7s; **Cairn**—nonirrigated—7c;

Patel—nonirrigated—7c

Range site: **Persayo**—Silty Shallow (calcareous) 5-8" p.z.; **Cairn**—Sandy Loam Upland (gravelly) 5-8" p.z.; **Patel**—Silty Upland (sodic) 5-8" p.z.

140—Benally loamy sand, 1 to 3 percent slopes, overblown

Setting

Landform: Eolian-mantled fan terraces

Shape of areas: Irregular

Size of areas: 100 to 3,000 acres

Elevation: 5,400 to 5,700 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Benally soil and similar soils: 80 percent

Contrasting inclusions: 20 percent

Contrasting Inclusions

- The moderately deep Werito soil on toeslopes and knolls
- The shallow Huerfano soil on toeslopes and knolls
- The moderately coarse textured Jeddito soil on low stream terraces

Typical Profile

- 0 to 4 inches—pale brown loamy sand
- 4 to 15 inches—pale brown fine sandy loam
- 15 to 56 inches—brown sandy clay loam and clay loam
- 56 to 64 inches—pale brown loamy sand

Soil Properties and Qualities

Parent material: Alluvium and eolian material derived from sandstone and shale

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately slow

Available water capacity: Moderate to high

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Very severe

Flooding frequency: Rare

Salinity: Slightly saline below a depth of 15 inches

Sodicity: Moderately sodic between 15 and 56 inches

Major Uses

Livestock grazing

Dominant vegetation in potential plant community: alkali sacaton, galleta, Indian ricegrass, sand dropseed, bottlebrush squirreltail, fourwing saltbush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—900

Unfavorable years—500

Present plant community:

alkali sacaton, galleta, Russian-thistle, Indian ricegrass

Major limitations: hazard of soil blowing, hazard of water erosion

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Vary the season of grazing and the periods of rest during successive years.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: Nonirrigated—6c

Range site: Sandy Loam Upland (sodic) 5-8" p.z.

142—Bebeever-Walrees complex, 0 to 2 percent slopes

Setting

Landform: Low, braided flood plains of the San Juan River

Position on the landform: **Bebeever**—interchannel bars; **Walrees**—intermittent channels

Slope: **Bebeever**—0 to 2 percent; **Walrees**—0 to 1 percent

Shape of areas: Irregular

Size of areas: 20 to 1,000 acres

Elevation: 4,600 to 5,000 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Bebeever loamy sand and similar soils: 60 percent

Walrees fine sandy loam and similar soils: 25 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The rarely flooded Green River soil on high bars
- 5 percent poorly and very poorly drained hydric soils in backwater marshes
- Riverwash adjacent to main channels of the river
- Water in small perennial channels
- Bebeever soils that have very cobbly surfaces on interchannel bars

Characteristics of the Bebeever Soil

Typical profile:

- 0 to 4 inches—pale brown loamy sand
- 4 to 13 inches—pale brown loamy fine sand
- 13 to 36 inches—pale brown gravelly coarse sand and very gravelly coarse sand
- 36 to 70 inches—light brownish gray sand

Parent material: Alluvium derived from sandstone, granite, and quartzite

Depth class: Very deep

Drainage class: Moderately well drained

Permeability: Moderately rapid

Available water capacity: Very low to low

Surface runoff: Very slow

Hazard of water erosion: Very slight

Hazard of soil blowing: Very severe

Salinity: Very slightly saline

Flooding frequency: Occasional, very brief periods

Depth to seasonal high water table: 3.5 to 5.0 feet

Characteristics of the Walrees Soil

Typical profile:

- 0 to 4 inches—pale brown fine sandy loam
- 4 to 12 inches—pale brown loam
- 12 to 17 inches—pale brown loamy fine sand
- 17 to 30 inches—light brownish gray fine sandy loam and silt loam
- 30 to 62 inches—light brownish gray stratified very gravelly coarse sand and sand

Parent material: Alluvium derived from sandstone, shale, and quartzite

Depth class: Very deep

Drainage class: Somewhat poorly drained

Permeability: Moderately slow between 4 and 30 inches, very rapid below a depth of 30 inches

Available water capacity: Low

Surface runoff: Very slow

Hazard of water erosion: None

Hazard of soil blowing: Severe

Salinity: Slightly saline from 0 to 30 inches

Flooding frequency: Frequent, brief periods

Depth to seasonal high water table: 2.0 to 3.5 feet

Major Uses

Wildlife habitat

Bebeever soil

Dominant vegetation in potential plant community: alkali sacaton, inland saltgrass, sand dropseed, Indian ricegrass, Fremont cottonwood, threadleaf rubber rabbitbrush, Russian-olive, New Mexico olive

Annual production of air-dry vegetation (pounds per acre):

Favorable years—1,700

Unfavorable years—600

Present plant community:

New Mexico olive, saltcedar, threadleaf rubber rabbitbrush, inland saltgrass, alkali sacaton, Fremont cottonwood

Walrees soil

Dominant vegetation in potential plant community: Russian-olive, inland saltgrass, coyote willow, Fremont cottonwood, western wheatgrass, quackgrass, Baltic rush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—2,000

Unfavorable years—1,000

Present plant community:

saltcedar, coyote willow, inland saltgrass, western wheatgrass, quackgrass

Major limitations: hazard of soil blowing, flooding

Suitable management practices and concerns:

- Livestock grazing, woodcutting, and farming activities result in deterioration and removal of vegetation, which impairs use of this unit for wildlife habitat.
- Competition between livestock and wildlife is high year-round.
- This unit is well suited to the production of herbaceous plants, shrubs, and riparian plants for wildlife habitat.
- Riparian plants such as Fremont cottonwood, New Mexico olive, Russian-olive, and coyote willow will grow where soil moisture is adequate. These trees provide habitat for a large number of wildlife species.
- Small backwater marshes contain hydrophytic vegetation such as cattails and bulrushes. Unique wetland plants attract waterfowl for food and nesting.
- These areas also furnish wetland wildlife habitat for many species of mammals, fish, amphibians, and invertebrates.
- Riparian vegetation should be replanted in disturbed areas when the soil is moist.
- Protection from livestock grazing is essential.

Interpretive Groups

Land capability classification: **Bebeever**—

nonirrigated—4s; **Walrees**—nonirrigated—4w

Range site: **Bebeever**—Sandy Bottom (subirrigated) 5-8" p.z.; **Walrees**—Loamy Bottom (subirrigated) 5-8" p.z.

145—Razito-Huerfano complex, 0 to 8 percent slopes

Setting

Landform: Undulating plateaus

Position on the landform: **Razito**—stable, linear dunes; **Huerfano**—toeslopes below knolls and interdune areas

Slope: **Razito**—1 to 8 percent; **Huerfano**—0 to 3 percent

Shape of areas: Irregular

Size of areas: 20 to 1,000 acres

Elevation: 5,600 to 6,000 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Razito loamy fine sand and similar soils: 45 percent
 Huerfano sandy clay loam and similar soils: 40 percent
 Contrasting inclusions: 15 percent

Contrasting Inclusions

- Huerfano soils mantled by 6 to 30 inches of eolian fine sand
- The fine textured Chipeta soil on knolls and footslopes
- The frequently flooded Hamburn soil on flood plains
- The very deep, fine textured Notal soil on small depressions
- Badland of barren shale and soft sandstone exposed on backslopes

Characteristics of the Razito Soil

Typical profile:

- 0 to 8 inches—light yellowish brown loamy fine sand
- 8 to 62 inches—light yellowish brown loamy fine sand and fine sand

Parent material: Eolian material derived from sandstone

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Rapid

Available water capacity: Low

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Very severe

Characteristics of the Huerfano Soil

Typical profile:

- 0 to 1 inch—pale brown sandy clay loam
- 1 to 11 inches—brown sandy clay loam
- 11 to 18 inches—light brownish gray clay loam
- 18 inches—shale bedrock

Parent material: Alluvium and residuum derived from shale and sandstone

Depth class: Shallow

Drainage class: Well drained

Permeability: Moderately slow

Available water capacity: Very low

Surface runoff: Medium

Hazard of water erosion: Moderate

Hazard of soil blowing: Severe

Salinity: Moderately saline between 11 inches and 18 inches

Sodicity: Strongly sodic between 1 inch and 11 inches

Major Uses

Livestock grazing

Razito soil

Dominant vegetation in potential plant community:

Indian ricegrass, blue grama, sand dropseed, sandhill muhly, mesa dropseed, galleta, fourwing saltbush, broom snakeweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—500

Unfavorable years—250

Present plant community:

Indian ricegrass, Greene rabbitbrush, broom snakeweed, blue grama, Fendler threeawn, galleta

Huerfano soil

Dominant vegetation in potential plant community:

alkali sacaton, mound saltbush, ribscale, galleta, Indian ricegrass

Annual production of air-dry vegetation (pounds per acre):

Favorable years—500

Unfavorable years—300

Present plant community:

alkali sacaton, galleta, ribscale, mound saltbush

Major limitations:

Razito—hazard of soil blowing

Huerfano—hazard of soil blowing, hazard of water erosion

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Vary the season of grazing and the periods of rest during successive years.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Razito**—nonirrigated—7c, irrigated—4s; **Huerfano**—nonirrigated—7s

Range site: **Razito**—Sandy Upland 5-8" p.z.;

Huerfano—Loamy Upland (sodic) 5-8" p.z.

147—Escavada sand, 0 to 1 percent slopes

Setting

Landform: High flood plains of the San Juan River

Shape of areas: Long and narrow

Size of areas: 5 to 100 acres

Elevation: 4,600 to 5,000 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Escavada soil and similar soils: 85 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The strongly saline Green River soil in areas bordering map unit 157
- The moderately well drained Bebeever soil that has cobbly surfaces on interchannel bars

Typical Profile

- 0 to 5 inches—pale brown sand
- 5 to 70 inches—pale brown and light brownish gray stratified coarse sand to very fine sandy loam

Soil Properties and Qualities

Parent material: Alluvium derived from sandstone

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately rapid

Available water capacity: Very low

Surface runoff: Very slow

Hazard of water erosion: Very slight

Hazard of soil blowing: Very severe

Flooding frequency: Rare

Depth to seasonal high water table: 5.0 to 6.0 feet

Major Uses

Livestock grazing

Dominant vegetation in potential plant community:

Indian ricegrass, western wheatgrass, alkali sacaton, fourwing saltbush, green rubber rabbitbrush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—1,000

Unfavorable years—600

Present plant community:

Indian ricegrass, red threeawn, basin big sagebrush, green rubber rabbitbrush, cheatgrass, saltcedar, Fremont cottonwood

Major limitations: hazard of soil blowing

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Vary the season of grazing and the periods of rest during successive years.
- Reduce the risk of soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: Nonirrigated—6s

Range site: Sandy Bottom 5-8" p.z.

150—Chipeta-Badland-Moncisco complex, 2 to 45 percent slopes

Setting

Landform: Hills

Position on the landform: **Chipeta**—knolls, footslopes, and backslopes; **Badland**—backslopes; **Moncisco**—footslopes and backslopes

Slope: **Chipeta**—2 to 35 percent; **Moncisco**—15 to 45 percent

Shape of areas: Irregular

Size of areas: 50 to 3,000 acres

Elevation: 5,600 to 5,900 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Chipeta silty clay loam and similar soils: 35 percent
Badland: 30 percent

Moncisco extremely channery sandy clay loam and similar soils: 15 percent

Contrasting inclusions: 20 percent

Contrasting Inclusions

- The moderately slowly permeable Huerfano soils on toeslopes
- The very deep, moderately coarse textured Jeddito soil on low stream terraces
- The shallow, medium textured Persayo soil on structural benches
- Rock outcrop as exposures of sandstone bedrock occurring as small cliffs and pedestal rocks

Characteristics of the Chipeta Soil

Typical profile:

- 0 to 2 inches—light brownish gray silty clay loam
- 2 to 10 inches—grayish brown silty clay
- 10 inches—shale bedrock

Parent material: Alluvium and residuum derived from shale

Depth class: Shallow

Drainage class: Well drained

Permeability: Slow

Available water capacity: Very low

Surface runoff: Medium to rapid

Hazard of water erosion: Very severe

Hazard of soil blowing: Severe

Salinity: Strongly saline

Sodicity: Strongly sodic

Shrink-swell potential: High

Characteristics of Badland

Badland consists of exposures of barren shale bedrock. It occurs as steep, convex backslopes intermingled with the Chipeta soil. There is little or no vegetation, and surface runoff is rapid.

Characteristics of the Moncisco Soil

Typical profile:

- 0 to 2 inches—pale brown extremely channery sandy clay loam
- 2 to 11 inches—light reddish brown extremely channery sandy clay loam
- 11 to 70 inches—light red and red fragmental material composed of porcelanite

Parent material: Eolian material derived from sandstone and residuum derived from porcelanite

Depth class: Very deep

Drainage class: Excessively drained

Permeability: Moderate in upper part; very rapid in lower

Available water capacity: Very low

Surface runoff: Rapid

Hazard of water erosion: Severe

Hazard of soil blowing: Very slight

Salinity: Slightly saline between 2 and 11 inches

Major Uses

Livestock grazing

Chipeta soil

Dominant vegetation in potential plant community: alkali sacaton, galleta, Indian ricegrass, bottlebrush squirreltail, shadscale, mound saltbush, sickle saltbush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—300

Unfavorable years—150

Present plant community:

mound saltbush, shadscale, ribscale, alkali sacaton

Moncisco soil

Dominant vegetation in potential plant community: alkali sacaton, shadscale, galleta, Indian ricegrass, bottlebrush squirreltail, mound saltbush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—550

Unfavorable years—350

Present plant community:

alkali sacaton, galleta, Indian ricegrass, bottlebrush squirreltail, shadscale

Major limitations:

Chipeta—hazard of water erosion, hazard of soil blowing, steep slopes, shrink-swell potential

Moncisco—hazard of water erosion, steep slopes, subsurface rock fragments

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Uniform distribution of grazing is difficult because of the slope or the lack of permanent water developments, or both.
- Livestock prefer to graze the easily accessible areas before they graze the steep slopes.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Vary the season of grazing and the periods of rest during successive years.
- Control the time and amount of use by livestock.
- Reduce the risk of water erosion and soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Chipeta**—nonirrigated—7s; **Moncisco**—nonirrigated—7e; **Badland**—nonirrigated—8s
Range site: **Chipeta**—Breaks 5-8" p.z.; **Moncisco**—Porcelanite Hills 5-8" p.z.; **Badland**—not assigned

153—Green River-Green River, saline, fine sandy loams, 0 to 1 percent slopes

Setting

Landform: High flood plains of the San Juan River
Position on the landform: **Green River**—cultivated areas; **Green River, saline**—virgin, non-cultivated areas
Shape of areas: Irregular
Size of areas: 15 to 275 acres
Elevation: 4,700 to 5,000 feet
Mean annual precipitation: 5 to 8 inches
Mean annual air temperature: 51 to 54 degrees F
Frost-free period: 140 to 160 days

Composition

Green River soil and similar soils: 50 percent
 Green River, saline soil and similar soils: 40 percent
 Contrasting inclusions: 10 percent

Contrasting Inclusions

- The moderately fine textured Werjo soils in slightly lower areas
- The somewhat poorly drained Werlog soil in old channel areas
- The coarse textured Escavada soil on high bars
- Urban land within the town of Shiprock

Characteristics of the Green River Soil

Typical profile:

- 0 to 6 inches—grayish brown fine sandy loam
- 6 to 10 inches—grayish brown loam
- 10 to 55 inches—brown and pale brown stratified fine sandy loam to silt loam
- 55 to 68 inches—pale brown stratified coarse sand to fine sandy loam

Parent material: Alluvium derived from sandstone

Depth class: Very deep

Drainage class: Moderately well drained

Permeability: Moderate

Available water capacity: Moderate to high

Water intake rate: Moderately rapid

Surface runoff: Very slow

Hazard of water erosion: Very slight

Hazard of soil blowing: Severe

Flooding frequency: Rare

Salinity: Slightly saline

Depth to seasonal high water table: 3.5 to 5.0 feet

Characteristics of the Green River, saline Soil

Typical profile:

- 0 to 2 inches—grayish brown fine sandy loam
- 2 to 16 inches—pale brown fine sandy loam
- 16 to 52 inches—pale brown stratified fine sand to silt loam
- 52 to 66 inches—light brownish gray stratified coarse sand to fine sandy loam

Parent material: Alluvium derived from sandstone

Depth class: Very deep

Drainage class: Moderately well drained

Permeability: Moderate

Available water capacity: Low

Surface runoff: Very slow

Hazard of water erosion: Very slight

Hazard of soil blowing: Severe

Flooding frequency: Rare

Salinity: Strongly saline between 25 and 52 inches

Sodicity: Slightly sodic

Corrosion potential: High

Depth to seasonal high water table: 3.5 to 5.0 feet

Major Uses

Irrigated cropland and pasture

Urban development

Livestock grazing

Irrigated cropland and pasture

Suitable crops:

Green River—alfalfa for hay, fruits, melons, corn, grasses and legumes for pasture

Green River, saline—none

Major limitations:

Green River—hazard of soil blowing

Green River, saline—hazard of soil blowing, salinity

Suitable management practices and concerns:

Green River soil

- Suitable irrigation systems are furrow, border, corrugation, and sprinkler.
- Because the soil is droughty, light and frequent irrigation is recommended.
- Land leveling is needed for uniform application of water with furrow, border, and corrugation methods.
- The seasonal high water table provides supplemental moisture for deep-rooted crops.
- Irrigate carefully to prevent a rise in the level of the

water table, which increases the concentration of soluble salts and sodium in the soil.

- Maintain tilth by returning crop residue to the soil, using legume mixtures, and using conservation tillage methods.
- Reduce the risk of soil blowing by planting field windbreaks and maintaining a plant cover.
- Maintain the quality and quantity of forage by rotating grazing, mowing and clipping, controlling weeds, and fertilizing.
- All crops but legumes respond to nitrogen. Legumes respond to phosphorus.

Green River, saline soil

- The concentration of soluble salts limits the kinds of crops that can be grown.
- Most climatically suited crops can be grown if the concentration of soluble salts can be reduced by leaching.
- The concentration of salts and sodium limits the production of some hay and pasture plants.

Urban development

Major limitations: depth to water table, rare flooding, salinity, corrosivity, hazard of soil blowing

Suitable management practices and concerns:

- Shallow excavations will be hindered by the presence of ground water.
- Septic tank absorption fields may function poorly because of seasonal wetness.
- Use mound-type septic systems to compensate for the seasonal wetness.
- If the density of housing is moderate to high, a community sewage system will be needed to prevent pollution of the ground water.
- Reduce the hazard of flooding by locating structures above the expected flood level.
- Some areas of this unit may be subject to salt heaving because of the expansion of sodium sulfate salts. This action is likely to crack concrete slab floors, driveways, and sidewalks.
- Prevent structural damage that results from salt heaving by designing foundations and footings to allow for heaving and by diverting runoff away from buildings.
- The quality of roadbeds and road surfaces can be adversely affected by salt heaving.
- Local roads and streets may require a special base to prevent salt heave damage.
- Excavation for roads can expose material that is highly susceptible to wind erosion.
- Preserve the existing plant cover during construction activities to reduce the risk of soil blowing and water erosion.

- Offset the risk of corrosion to uncoated steel and concrete by using corrosion-resistant materials for foundations and underground utilities.

- Provide an adequate wearing surface on roads to reduce the amount of dust and lower maintenance costs.

Livestock grazing

Green River, saline soil

Dominant vegetation in potential plant community:

inland saltgrass, alkali sacaton, threadleaf rubber rabbitbrush, black greasewood, New Mexico olive, fourwing saltbush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—1,800

Unfavorable years—800

Present plant community:

inland saltgrass, alkali sacaton, threadleaf rubber rabbitbrush, black greasewood, New Mexico olive

Major limitations: hazard of soil blowing

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Windbreaks and Environmental Plantings

- Windbreaks are needed to limit soil losses, maintain optimum crop yields, protect farm and ranch buildings, and provide cover for wildlife.
- The trees and shrubs selected for planting should be suited to the conditions of the site.
- Irrigation should be provided for the establishment and maintenance of windbreaks.

Interpretive Groups

Land capability classification: **Green River**—

irrigated—2e; **Green River, saline**—

nonirrigated—7c

Range site: **Green River**—Salt Meadow 5-8" p.z.;

Green River, saline—Salt Meadow 5-8" p.z.

155—Mesa fine sandy loam, 1 to 4 percent slopes

Setting

Landform: Treads of high stream terraces and fan terraces

Shape of areas: Irregular

Size of areas: 100 to 1,500 acres

Elevation: 5,700 to 6,100 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Mesa soil and similar soils: 85 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The moderately sodic Kimbeto soil throughout the unit
- The moderately coarse textured, gravelly Blackston soil on 4 to 10 percent slopes

Characteristics of the Mesa Soil

Typical profile:

- 0 to 2 inches—light brown fine sandy loam
- 2 to 21 inches—brown and pink gravelly sandy clay loam
- 21 to 37 inches—pink very cobbly sandy loam
- 37 to 47 inches—pink very gravelly sandy loam
- 47 to 63 inches—pinkish gray clay loam

Parent material: Alluvium derived from sandstone and shale

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Moderate

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Severe

Sodicity: Slightly sodic below a depth of 47 inches

Major Uses

Livestock grazing

Dominant vegetation in potential plant community:

galleta, Indian ricegrass, blue grama, bottlebrush squirreltail, fourwing saltbush, sand dropseed, Greene rabbitbrush, winterfat

Annual production of air-dry vegetation (pounds per acre):

Favorable years—550

Unfavorable years—350

Present plant community:

galleta, alkali sacaton, Fendler threeawn, Indian ricegrass, broom snakeweed

Major limitations: hazard of soil blowing

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: Nonirrigated—7c

Range site: Loamy Upland 5-8" p.z.

157—Werjo, saline-Werjo loams, 0 to 1 percent slopes

Setting

Landform: High flood plains of the San Juan River

Position on the landform: **Werjo, saline**—virgin, non-cultivated areas; **Werjo**—cultivated areas

Shape of areas: Irregular

Size of areas: 15 to 175 acres

Elevation: 4,700 to 5,000 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Werjo, saline soil and similar soils: 50 percent

Werjo soil and similar soils: 35 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The somewhat poorly drained Werlog soil in lower, old channel areas
- The moderately coarse textured Green River soil throughout the unit
- Urban land within the town of Shiprock

Characteristics of the Werjo, saline Soil

Typical profile:

- 0 to 4 inches—grayish brown loam
- 4 to 12 inches—pale brown fine sandy loam

- 12 to 66 inches—pale brown and light brownish gray stratified fine sandy loam to silty clay loam
- Parent material:* Alluvium derived from sandstone and shale

Depth class: Very deep

Drainage class: Moderately well drained

Permeability: Moderately slow

Available water capacity: Low

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Severe

Flooding frequency: Rare

Salinity: Strongly saline

Sodicity: Moderately sodic

Frost action potential: Moderate

Corrosion potential: High

Depth to seasonal high water table: 3.5 to 5.0 feet

Characteristics of the Werjo Soil

Typical profile:

- 0 to 6 inches—grayish brown loam
- 6 to 12 inches—pale brown and grayish brown sandy clay loam
- 12 to 70 inches—pale brown stratified fine sandy loam to silty clay loam

Parent material: Alluvium derived from sandstone and shale

Depth class: Very deep

Drainage class: Moderately well drained

Permeability: Moderately slow

Available water capacity: High

Water intake rate: Moderately slow

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Severe

Flooding frequency: Rare

Salinity: Slightly saline below a depth of 12 inches

Sodicity: Slightly sodic below a depth of 12 inches

Frost action potential: Moderate

Corrosion potential: High

Depth to seasonal high water table: 3.5 to 5.0 feet

Major Uses

Irrigated cropland and pasture

Urban development

Livestock grazing

Irrigated cropland and pasture

Suitable crops:

Werjo, saline—salt-tolerant grasses for pasture

Werjo—alfalfa for hay, fruit, melons, corn, grasses and legumes for pasture

Major limitations:

Werjo, saline—hazard of soil blowing, salinity

Werjo—hazard of soil blowing

Suitable management practices and concerns:

Werjo, saline soil

- The concentration of soluble salts limits the kinds of crops that can be grown.
- Most climatically suited crops can be grown if the concentration of soluble salts can be reduced by leaching.
- The concentration of salts and sodium limits the production of some hay and pasture plants.

Werjo soil

- Suitable irrigation systems are furrow, border, corrugation, and sprinkler.
- Land leveling is needed for uniform application of water with furrow, border, and corrugation methods.
- The seasonal high water table provides supplemental moisture for plants.
- A plowpan forms if the soil is excessively cultivated.
- All crops but legumes respond to nitrogen. Legumes respond to phosphorus.
- Irrigate carefully to prevent a rise in the level of the water table, which increases the concentration of soluble salts and sodium in the soil.
- Maintain tilth by returning crop residue to the soil, using legume mixtures, and using conservation tillage methods.
- Reduce the risk of soil blowing by planting field windbreaks and maintaining a plant cover.
- Grazing when the soil is dry reduces compaction of the surface layer, maintains tilth, and prevents excessive runoff.
- Maintain the quality and quantity of forage by rotating grazing, mowing and clipping, controlling weeds, and fertilizing.

Urban development

Major limitations: depth to water table, rare flooding, permeability, salinity, potential frost action, corrosivity, hazard of soil blowing

Suitable management practices and concerns:

- Shallow excavations will be hindered by the presence of ground water.
- Reduce the hazard of flooding by locating structures above the expected flood level and away from washes.
- Septic tank absorption fields may function poorly because of seasonal wetness and the restricted permeability of the soils.
- Use mound-type septic systems to compensate for the seasonal wetness.
- Increase the size of septic tank absorption fields to compensate for the moderately slow soil permeability.
- If the density of housing is moderate to high, a

community sewage system will be needed to prevent pollution of the ground water.

- Some areas of this unit may be subject to salt heaving because of the expansion of sodium sulfate salts. This action is likely to crack concrete slab floors, driveways, and sidewalks.
- Prevent structural damage that results from salt heaving by designing foundations and footings to allow for heaving and by diverting runoff away from buildings.
- The quality of roadbeds and road surfaces can be adversely affected by salt heaving and frost action.
- Local roads and streets may require a special base to prevent salt and frost heave damage.
- Offset the risk of corrosion to uncoated steel and concrete by using corrosion-resistant materials for foundations and underground utilities.
- Excavation for roads can expose soil material that is highly susceptible to wind erosion.
- Preserve the existing plant cover during construction activities to reduce the risk of soil blowing.
- Provide an adequate wearing surface on roads to reduce the amount of dust and lower maintenance costs.
- Install culverts to carry seasonal runoff where roads cross natural drainageways.

Livestock grazing

Werjo, saline soil

Dominant vegetation in potential plant community: inland saltgrass, alkali sacaton, threadleaf rubber rabbitbrush, black greasewood, New Mexico olive, fourwing saltbush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—1,800

Unfavorable years—800

Present plant community:

inland saltgrass, alkali sacaton, threadleaf rubber rabbitbrush, black greasewood, New Mexico olive

Major limitations: hazard of soil blowing

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.

- Reduce the risk of soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Windbreaks and Environmental Plantings

- Windbreaks are needed to limit soil losses, maintain optimum crop yields, protect farm and ranch buildings, and provide cover for wildlife.
- The trees and shrubs selected for planting should be suited to the conditions of the site.
- Irrigation should be provided for the establishment and maintenance of windbreaks.

Interpretive Groups

Land capability classification: **Werjo, saline**—nonirrigated—7s; **Werjo**—irrigated—2e

Range site: **Werjo, saline**—Salt Meadow 5-8" p.z.; **Werjo**—Salt Meadow 5-8" p.z.

160—Notal-Escavada-Riverwash association, 0 to 1 percent slopes

Setting

Landform: Valley floors along the Chaco River

Position on the landform: **Notal**—low stream terraces;

Escavada—flood plains; **Riverwash**—channels

Shape of areas: Long and narrow

Size of areas: 100 to 3,000 acres

Elevation: 4,900 to 5,800 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Notal silty clay loam and similar soils: 45 percent

Escavada very fine sandy loam and similar soils: 30 percent

Riverwash: 15 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- The rapidly permeable Razito soil on stable dunes
- Escavada soils in backwater areas of flood plains which have 5 to 35 inches of silty clay over fine sand
- Jeddito soils on lower portions of stream terraces which are strongly saline and have a high water table
- Flowing water in the channel of the Chaco River from where it crosses the Hogback to where it joins the San Juan River

Characteristics of the Notal Soil

Typical profile:

- 0 to 3 inches—pale brown silty clay loam

- 3 to 11 inches—grayish brown silty clay loam
 - 11 to 70 inches—grayish brown silty clay
- Parent material:* Alluvium derived from shale
Depth class: Very deep
Drainage class: Well drained
Permeability: Very slow
Available water capacity: Moderate to high
Surface runoff: Slow
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Flooding frequency: Rare
Salinity: Moderately saline below a depth of 11 inches
Sodicity: Moderately sodic below a depth of 11 inches

Characteristics of the Escavada Soil

Typical profile:

- 0 to 2 inches—light brownish gray very fine sandy loam
 - 2 to 70 inches—pale brown, grayish brown, and light brownish gray stratified fine sand to silty clay loam
- Parent material:* Alluvium derived from sandstone and shale
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Low
Surface runoff: Very slow
Hazard of water erosion: None
Hazard of soil blowing: Severe
Flooding frequency: Occasional, very brief periods
Salinity: Slightly saline
Depth to seasonal high water table: 5.0 to 6.0 feet

Characteristics of Riverwash

Riverwash consists of unstable sand and silt that is reworked by water and wind so frequently that it supports little or no vegetation. Riverwash occurs in stream channels and is subject to frequent, brief periods of flooding from prolonged high-intensity storms.

Major Uses

Livestock grazing

Notal soil

Dominant vegetation in potential plant community: alkali sacaton, mound saltbush, galleta, black greasewood
Annual production of air-dry vegetation (pounds per acre):
 Favorable years—600
 Unfavorable years—400
Present plant community:

alkali sacaton, black greasewood, mound saltbush, Torrey seapweed

Escavada soil

Dominant vegetation in potential plant community:

Indian ricegrass, alkali sacaton, western wheatgrass, bottlebrush squirreltail, fourwing saltbush, green rubber rabbitbrush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—1,000

Unfavorable years—600

Present plant community:

alkali sacaton, saltcedar, cheatgrass, green rubber rabbitbrush, western wheatgrass

Major limitations:

Notal—hazard of soil blowing, hazard of water erosion

Escavada—hazard of soil blowing, occasional flooding

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Notal**—nonirrigated—7c; **Escavada**—nonirrigated—6e; **Riverwash**—nonirrigated—8

Range site: **Notal**—Clay Loam Terrace (sodic) 5-8" p.z.; **Escavada**—Sandy Bottom 5-8" p.z.; **Riverwash**—not assigned

163—Werlog silty clay loam, 0 to 1 percent slopes

Setting

Landform: Old channels on high flood plains of the San Juan River

Shape of areas: Elongate

Size of areas: 5 to 100 acres

Elevation: 4,600 to 5,000 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Werlog soil and similar soils: 85 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The moderately coarse textured Green River, saline soil on small, high bars
- 5 percent poorly drained hydric soils in old, lowest channel areas

Typical Profile

- 0 to 2 inches—grayish brown silty clay loam
- 2 to 12 inches—grayish brown silt loam
- 12 to 65 inches—light brownish gray, pale brown, and gray stratified fine sandy loam to silty clay

Soil Properties and Qualities

Parent material: Alluvium derived from sandstone and shale

Depth class: Very deep

Drainage class: Somewhat poorly drained

Permeability: Moderately slow

Available water capacity: High

Water intake rate: Slow

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Severe

Flooding frequency: Rare

Salinity: Strongly saline

Sodicity: Moderately sodic

Frost action potential: Moderate

Corrosion potential: High

Depth to seasonal high water table: 2.0 to 3.5 feet

Major Uses

Livestock grazing

Irrigated cropland and pasture

Urban development

Livestock grazing

Dominant vegetation in potential plant community:

inland saltgrass, alkali sacaton, saltsedge, alkali bluegrass, foxtail barley

Annual production of air-dry vegetation (pounds per acre):

Favorable years—1,800

Unfavorable years—800

Present plant community:

inland saltgrass, kochia, other annual weeds

Major limitations: hazard of soil blowing, salinity

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.
- Delay grazing until the soil is dry and firm enough to withstand trampling by livestock.

Irrigated cropland and pasture

Suitable crops: salt-tolerant grasses for pasture

Major limitations: depth to water table, salinity, slow water intake rate, hazard of soil blowing

Suitable management practices and concerns:

- The salinity and wetness of the soil limits the kinds of crops that can be grown.
- The concentration of soluble salts limits the production of some hay and pasture plants.
- Most climatically suited crops can be grown if adequate drainage can be provided to reduce the concentration of soluble salts.
- Lower the water table by installing a drainage system.
- Suitable irrigation systems are furrow, border, corrugation, and sprinkler.
- Land leveling is needed for uniform application of water with furrow, border, and corrugation methods.
- Irrigate carefully to prevent a rise in the level of the water table, which increases the concentration of soluble salts and sodium in the soil.
- Irrigate at a rate that insures optimum production but does not increase deep percolation, runoff, and erosion.
- The seasonal high water table provides supplemental moisture for plants.
- A plowpan forms if the soil is excessively cultivated.
- All crops but legumes respond to nitrogen. Legumes respond to phosphorus.
- Maintain tilth by returning crop residue to the soil, using legume mixtures, and using conservation tillage methods.
- Reduce the risk of soil blowing by planting field windbreaks and maintaining a plant cover.

- Grazing when the soil is dry reduces compaction of the surface layer, maintains tilth, and prevents excessive runoff.
- Maintain the quality and quantity of forage by rotating grazing, mowing and clipping, controlling weeds, and fertilizing.

Urban development

Major limitations: depth to water table, rare flooding, permeability, salinity, potential frost action, corrosivity, hazard of soil blowing

Suitable management practices and concerns:

- Shallow excavations will be hindered by the presence of ground water.
- Reduce the hazard of flooding by locating structures above the expected flood level.
- Septic tank absorption fields will function poorly because of seasonal wetness and the moderately slow permeability of the soil.
- A community sewage system will be needed to prevent pollution of the ground water.
- Some areas of this unit may be subject to salt heaving because of the expansion of sodium sulfate salts. This action is likely to crack concrete slab floors, driveways, and sidewalks.
- Prevent structural damage that results from salt heaving by designing foundations and footings to allow for heaving and by diverting runoff away from buildings.
- The quality of roadbeds and road surfaces can be adversely affected by salt heaving and frost action.
- Local roads and streets may require a special base to prevent salt and frost heave damage.
- Offset the risk of corrosion to uncoated steel and concrete by using corrosion-resistant materials for foundations and underground utilities.
- Provide an adequate wearing surface on roads to reduce the amount of dust and lower maintenance cost.
- Install culverts to carry seasonal runoff where roads cross natural drainageways.

Windbreaks and Environmental Plantings

- Windbreaks are needed to limit soil losses, maintain optimum crop yields, protect farm and ranch buildings, and provide cover for wildlife.
- The trees and shrubs selected for planting should be suited to the conditions of the site.
- Irrigation should be provided for the establishment and maintenance of windbreaks.

Interpretive Groups

Land capability classification: Nonirrigated-7c

Range site: Salt Meadow 5-8" p.z.

165—Jeddito-Escavada association, 0 to 3 percent slopes

Setting

Landform: Valley floors

Position on the landform: **Jeddito**—low stream terraces; **Escavada**—flood plains

Slope: **Jeddito**—0 to 3 percent; **Escavada**—0 to 1 percent

Shape of areas: Long and narrow

Size of areas: 20 to 2,000 acres

Elevation: 4,700 to 6,000 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Jeddito loamy fine sand and similar soils: 70 percent

Escavada very fine sandy loam and similar soils: 15 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- Riverwash in wash channels
- The frequently flooded Hamburn soil on small flood plains
- Nageezi soils which are gravelly along Sanostee Wash east of U.S. Highway 666

Characteristics of the Jeddito Soil

Typical profile:

- 0 to 9 inches—light brown and brown loamy fine sand
- 9 to 27 inches—light brown loamy fine sand and loamy very fine sand
- 27 to 68 inches—brown and light brown stratified fine sand to silty clay loam

Parent material: Alluvium derived from sandstone and shale

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately slow

Available water capacity: Moderate

Water intake rate: Rapid

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Very severe

Flooding frequency: Rare

Salinity: Slightly saline below a depth of 27 inches

Sodicity: Slightly sodic below a depth of 9 inches

Corrosion potential: High for steel, moderate for concrete

Characteristics of the Escavada Soil

Typical profile:

- 0 to 4 inches—brown very fine sandy loam
- 4 to 70 inches—pale brown and light brown stratified fine sand to silty clay

Parent material: Alluvium derived from sandstone and shale

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Low to moderate

Surface runoff: Very slow

Hazard of water erosion: Very slight

Hazard of soil blowing: Severe

Flooding frequency: Occasional, very brief periods

Salinity: Slightly saline below a depth of 20 inches

Major Uses

Livestock grazing

Irrigated cropland and pasture

Urban development

Livestock grazing

Jeddito soil

Dominant vegetation in potential plant community:
alkali sacaton, Indian ricegrass, mound saltbush, galleta, black greasewood

Annual production of air-dry vegetation (pounds per acre):

Favorable years—650

Unfavorable years—450

Present plant community:

black greasewood, alkali sacaton, Russian-thistle, galleta, mound saltbush

Escavada soil

Dominant vegetation in potential plant community:
Indian ricegrass, alkali sacaton, western wheatgrass, bottlebrush squirreltail, fourwing saltbush, green rubber rabbitbrush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—1,000

Unfavorable years—600

Present plant community:

alkali sacaton, green rubber rabbitbrush, saltcedar, cheatgrass

Major limitations:

Jeddito—hazard of soil blowing

Escavada—hazard of soil blowing, occasional flooding

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Irrigated cropland and pasture

Suitable crops:

Jeddito—alfalfa for hay, melons, squash, corn, grasses and legumes for pasture

Major limitations: lack of dependable irrigation water, rapid water intake rate, hazard of soil blowing

Suitable management practices and concerns:

- Suitable irrigation systems are furrow, border, and corrugation.
- Because the soil is droughty, light and frequent irrigation is recommended.
- Land leveling is needed for uniform application of water.
- Use pipes, ditch linings, or drop structures in irrigation ditches to facilitate irrigation and reduce the risk of ditch erosion.
- Irrigate at a rate that insures optimum production, but does not increase deep percolation, runoff, and erosion.
- All crops but legumes respond to nitrogen. Legumes respond to phosphorus.
- Maintain tilth by returning crop residue to the soil, using legume mixtures, and using conservation tillage methods.
- Reduce the risk of soil blowing by planting field windbreaks and maintaining a plant cover.
- Maintain the quality and quantity of forage by rotating grazing, mowing and clipping, controlling weeds, and fertilizing.

Urban development

Major limitations: permeability, flooding, corrosivity, hazard of soil blowing

Suitable management practices and concerns:

Jeddito soil

- Septic tank absorption fields may function poorly because of the moderately slow permeability of the soil.
- Increase the size of septic tank absorption fields to compensate for the moderately slow soil permeability.
- If the density of housing is moderate to high, a community sewage system will be needed to prevent pollution of the ground water.
- Reduce the hazard of flooding by locating structures above the expected flood level and away from washes.
- Offset the risk of corrosion to uncoated steel and concrete by using corrosion-resistant materials for foundations and underground utilities.
- This unit is a good source of roadfill.
- Excavation activities can expose soil material that is highly susceptible to blowing.
- Excavation increases the risk of water erosion.
- Preserve the existing plant cover during construction activities to reduce the risk of soil blowing.
- Provide an adequate wearing surface on roads to reduce the amount of dust and lower maintenance cost.
- Install culverts to carry seasonal runoff where roads cross natural drainageways.

Windbreaks and Environmental Plantings**Jeddito soil**

- Windbreaks are needed to limit soil losses, maintain optimum crop yields, protect farm and ranch buildings, and provide cover for wildlife.
- The trees and shrubs selected for planting should be suited to the conditions of the site.
- Irrigation should be provided for the establishment and maintenance of windbreaks.

Interpretive Groups

Land capability classification: **Jeddito**—

nonirrigated—7c; **Escavada**—nonirrigated—6e

Range site: **Jeddito**—Sandy Terrace (sodic) 5-8" p.z.;

Escavada—Sandy Bottom 5-8" p.z.

167—Hoskay-Patel-Badland complex, 1 to 25 percent slopes**Setting**

Landform: Dissected fan terraces and hills

Position on the landform: **Hoskay**—treads; **Patel**—footslopes; **Badland**—backslopes

Slope: **Hoskay**—1 to 10 percent; **Patel**—5 to 25 percent

Shape of areas: Irregular

Size of areas: 20 to 2,000 acres

Elevation: 4,800 to 5,100 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Hoskay channery loam and similar soils: 40 percent
Patel channery silty clay loam and similar soils: 30 percent

Badland: 15 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The moderately coarse textured Nageezi soil on eolian-mantled treads of fan terraces
- The very slowly permeable Notal soil on low fan terraces
- The shallow Chipeta soil on footslopes near badland

Characteristics of the Hoskay Soil

Typical profile:

- 0 to 2 inches—light yellowish brown channery loam
- 2 to 6 inches—yellowish brown clay loam
- 6 to 14 inches—light yellowish brown clay
- 14 to 27 inches—light gray and pale brown gypsiferous material which is an apparent clay loam
- 27 to 39 inches—pale brown channery clay loam
- 39 to 65 inches—light yellowish brown silty clay

Parent material: Alluvium derived from shale, sandstone, and limestone

Depth class: Very deep

Drainage class: Well drained

Permeability: Slow

Available water capacity: Low to moderate

Surface runoff: Medium

Hazard of water erosion: Severe

Hazard of soil blowing: Severe

Salinity: Strongly saline below a depth of 21 inches

Sodicity: Moderately sodic below a depth of 2 inches

Shrink-swell potential: High

Characteristics of the Patel Soil

Typical profile:

- 0 to 2 inches—pale brown channery silty clay loam
- 2 to 12 inches—pale brown silty clay
- 12 to 16 inches—pale brown silty clay loam
- 16 to 33 inches—very pale brown and pale brown gypsiferous material which is an apparent silty clay loam
- 33 inches—shale bedrock

Parent material: Alluvium derived from shale and limestone

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Slow

Available water capacity: Low

Surface runoff: Rapid

Hazard of water erosion: Severe

Hazard of soil blowing: Severe

Salinity: Strongly saline below a depth of 22 inches

Sodicity: Moderately sodic

Characteristics of Badland

Badland consists of exposures of shale bedrock as backslopes on hills. There is little or no vegetation, and surface runoff is rapid.

Major Uses

Livestock grazing

Hoskay soil

Dominant vegetation in potential plant community:

Indian ricegrass, Castle Valley clover, galleta, bottlebrush squirreltail, alkali sacaton

Annual production of air-dry vegetation (pounds per acre):

Favorable years—500

Unfavorable years—300

Present plant community:

cheatgrass, sand dropseed, Indian ricegrass, galleta, Castle Valley clover

Patel soil

Dominant vegetation in potential plant community:

Indian ricegrass, Castle Valley clover, galleta, alkali sacaton, bottlebrush squirreltail, shadscale

Annual production of air-dry vegetation (pounds per acre):

Favorable years—500

Unfavorable years—300

Present plant community:

cheatgrass, Indian ricegrass, bottlebrush squirreltail, galleta, Castle Valley clover

Major limitations:

Hoskay—hazard of soil blowing, hazard of water erosion, shrink-swell potential

Patel—hazard of soil blowing, hazard of water erosion

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Provide periodic rest during spring in alternate years.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Hoskay**—

nonirrigated—7c; **Patel**—nonirrigated—7c;

Badland—nonirrigated—8s

Range site: **Hoskay**—Silty Upland (sodic) 5-8" p.z.;

Patel—Silty Upland (sodic) 5-8" p.z.; **Badland**—not assigned

170—Notal sandy clay loam, 0 to 1 percent slopes

Setting

Landform: Low stream terraces

Shape of areas: Elongated

Size of areas: 20 to 5,000 acres

Elevation: 5,000 to 5,900 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Notal soil and similar soils: 90 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- The moderately coarse textured Jeddito soil on low stream terraces along Captain Tom Wash and Pajarito Creek
- The coarse textured, occasionally flooded Escavada soil on narrow flood plains along Tocito Wash
- The medium textured, occasionally flooded Ravola soil along Dead Mans Wash
- Areas of Notal soils that have eolian hummocks 1 foot to 3 feet high

Typical Profile

- 0 to 2 inches—pale brown sandy clay loam
- 2 to 24 inches—grayish brown clay
- 24 to 46 inches—grayish brown and brown clay loam
- 46 to 66 inches—brown sandy clay loam

Soil Properties and Qualities

Parent material: Alluvium derived from shale, siltstone, and sandstone

Depth class: Very deep

Drainage class: Well drained

Permeability: Very slow

Available water capacity: Moderate to high

Water intake rate: Moderately slow

Surface runoff: Slow

Hazard of water erosion: Very slight

Hazard of soil blowing: Severe

Flooding frequency: Rare

Salinity: Moderately saline

Sodicity: Moderately sodic

Corrosion potential: High

Shrink-swell potential: Moderate

Major Uses

Livestock grazing

Irrigated cropland and pasture

Urban development

Livestock grazing

Dominant vegetation in potential plant community:

alkali sacaton, galleta, mound saltbush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—600

Unfavorable years—400

Present plant community:

alkali sacaton, mound saltbush, Russian-thistle, annual wheatgrass, annual forbs

Major limitations: hazard of soil blowing

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Irrigated cropland and pasture

Suitable crops: alfalfa for hay, melons, squash, corn, grasses and legumes for pasture

Major limitations: lack of dependable irrigation water, hazard of soil blowing, salinity, sodicity

Suitable management practices and concerns:

- The concentration of soluble salts and sodium limits the production of some hay and pasture plants.
- The salinity and sodicity of the soil limit the kinds of crops that can be grown.
- Reduce the content of salts and sodium by carefully applying irrigation water.
- Suitable irrigation systems are furrow, border, corrugation, and sprinkler.
- Land leveling is needed for uniform application of water with furrow, border, and corrugation methods.
- A plowpan forms if the soil is excessively cultivated.
- All crops but legumes respond to nitrogen. Legumes respond to phosphorus.
- Maintain tilth by returning crop residue to the soil, using legume mixtures, and using conservation tillage methods.
- Reduce the risk of soil blowing by planting field windbreaks and maintaining a plant cover.
- Grazing when the soil is dry reduces compaction of the surface layer, maintains tilth, and prevents excessive runoff.
- Maintain the quality and quantity of forage by rotating grazing, mowing and clipping, controlling weeds, and fertilizing.

Urban development

Major limitations: permeability, rare flooding, shrink-swell potential, corrosivity

Suitable management practices and concerns:

- Septic tank absorption fields will function poorly because of the very slow permeability of the soil.

- Increase the size of the septic tank absorption area to compensate for the restricted permeability.
- If the density of housing is moderate to high, a community sewage system will be needed to prevent pollution of the ground water.
- Reduce the hazard of flooding by locating structures above the expected flood level and away from washes.
- The quality of roadbeds and road surfaces can be adversely affected by shrinking and swelling of the soil, and low soil strength when wet.
- Prevent structural damage that results from shrinking and swelling by designing foundations and footings to allow for these hazards and by diverting runoff away from buildings.
- Offset the risk of corrosion to uncoated steel and concrete by using corrosion-resistant materials for foundations and underground utilities.
- Provide an adequate wearing surface on roads to reduce the amount of dust and lower maintenance costs.
- Install culverts to carry seasonal runoff where roads cross natural drainageways.

Windbreaks and Environmental Plantings

- Windbreaks are needed to limit soil losses, maintain optimum crop yields, protect farm and ranch buildings, and provide cover for wildlife.
- The trees and shrubs selected for planting should be suited to the conditions of the site.
- Irrigation should be provided for the establishment and maintenance of windbreaks.

Interpretive Groups

Land capability classification: Nonirrigated—7c, irrigated—3s

Range site: Clay Loam Terrace (sodic) 5-8" p.z.

173—Shiprock fine sandy loam, 1 to 3 percent slopes

Setting

Landform: Fan terraces

Shape of areas: Irregular

Size of areas: 10 to 1,000 acres

Elevation: 4,800 to 5,000 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Shiprock soil and similar soils: 85 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The moderately fine textured Mack soil on slopes of 0 to 1 percent
- Moderately coarse textured gypsiferous soils between Canal Creek and the Mancos River
- Urban land within the town of Shiprock

Typical Profile

- 0 to 11 inches—light brown fine sandy loam
- 11 to 43 inches—light brown fine sandy loam and very fine sandy loam
- 43 to 70 inches—light brown very fine sandy loam and fine sandy loam

Soil Properties and Qualities

Parent material: Alluvium and eolian material derived from sandstone

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately rapid

Available water capacity: High

Water intake rate: Moderately rapid

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Severe

Major Uses

Irrigated cropland and pasture

Urban development

Livestock grazing

Irrigated cropland and pasture

Suitable crops: alfalfa for hay, fruit, melons, corn, grasses and legumes for pastures

Major limitations: hazard of soil blowing

Suitable management practices and concerns:

- Because the soil is droughty, light and frequent irrigation is recommended.
- Suitable irrigation systems are furrow, border, corrugation, and sprinkler.
- Land leveling is needed for uniform application of water with furrow, border, and corrugation methods.
- All crops but legumes respond to nitrogen. Legumes respond to phosphorus.
- Use pipes, ditch linings, or drop structures in irrigation ditches to facilitate irrigation and reduce the risk of ditch erosion.
- Irrigate at a rate that insures optimum production but does not increase deep percolation, runoff, and erosion.
- Maintain tilth by returning crop residue to the soil,

using legume mixtures, and using conservation tillage methods.

- Reduce the risk of soil blowing by planting field windbreaks and maintaining a plant cover.
- Maintain the quality and quantity of forage by rotating grazing, mowing and clipping, controlling weeds, and fertilizing.

Urban development

Major limitations: hazard of soil blowing

Suitable management practices and concerns:

- This unit is a good source of roadfill.
- Excavation for roads and other purposes can expose soil material that is highly susceptible to blowing.
- Preserve the existing plant cover during construction activities to reduce the risk of soil blowing.
- Septic tank absorption fields should function well on this soil.
- If the density of housing is high, a community sewage system will be needed to prevent pollution of the ground water.
- Provide an adequate wearing surface on roads to reduce the amount of dust and lower maintenance costs.
- Install culverts to carry seasonal runoff where roads cross natural drainageways.

Livestock grazing

Dominant vegetation in potential plant community:

Indian ricegrass, galleta, blue grama, sand dropseed, fourwing saltbush, broom snakeweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—550

Unfavorable years—300

Present plant community:

Indian ricegrass, cheatgrass, galleta, sand dropseed, broom snakeweed

Major limitations: hazard of soil blowing

Suitable management practices and concerns:

- Continuous, intensive year-round grazing commonly results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing by preventing

overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Windbreaks and Environmental Plantings

- Windbreaks are needed to limit soil losses, maintain optimum crop yields, protect farm and ranch buildings, and provide cover for wildlife.
- The trees and shrubs selected for planting should be suited to the conditions of the site.
- Irrigation should be provided for the establishment and maintenance of windbreaks.

Interpretive Groups

Land capability classification: Nonirrigated—7c, irrigated—2e

Range site: Sandy Loam Upland 5-8" p.z.

175—Suwanee loam, 0 to 1 percent slopes

Setting

Landform: Flood plains along ephemeral streams

Shape of areas: Irregular

Size of areas: 100 to 1,500 acres

Elevation: 5,300 to 5,800 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Suwanee soil and similar soils: 85 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The rarely flooded Notal and Jeddito soils on low stream terraces
- Moderately coarse textured soils which are subject to frequent overbank flooding from nearby washes
- Riverwash in wash channels

Typical Profile

- 0 to 6 inches—brown loam
- 6 to 12 inches—brown silty clay loam
- 12 to 26 inches—light brown fine sandy loam
- 26 to 64 inches—light brown stratified silt loam and very fine sandy loam

Soil Properties and Qualities

Parent material: Alluvium derived from sandstone, siltstone, and shale

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately slow

Available water capacity: High to very high

Water intake rate: Moderately slow

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Severe

Flooding frequency: Occasional, very brief periods

Major Uses

Livestock grazing

Irrigated cropland and pasture

Livestock grazing

Dominant vegetation in potential plant community:

western wheatgrass, alkali sacaton, bottlebrush
squirreltail, galleta, fourwing saltbush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—1,800

Unfavorable years—800

Present plant community:

western wheatgrass, alkali sacaton, fourwing
saltbush, black greasewood, annual sunflower,
cocklebur, threadleaf rubber rabbitbrush

Major limitations: hazard of soil blowing, occasional
flooding

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.
- Range seeding may be needed if the better forage plants have decreased.
- Suitability for range seeding is fair because of climate factors.
- Seed the range if the plant cover is not sufficient to protect the soil from erosion.
- Seed late in the fall for best results.
- After seeding, defer grazing until the young plants are well established.

Irrigated cropland and pasture

Suitable crops: corn, melons, squash, grasses and
legumes for pasture

Major limitations: lack of dependable irrigation water,
hazard of soil blowing, occasional flooding

Suitable management practices and concerns:

- Some areas of this unit are subject to frequent flooding which limits use for crops and pasture.
- Protect fields from destructive floods by constructing protective embankments.
- Suitable irrigation systems are furrow, border, and corrugation.
- Land leveling is needed for uniform application of water.
- A plowpan forms if the soil is excessively cultivated.
- All crops but legumes respond to nitrogen. Legumes respond to phosphorus.
- Maintain tilth by returning crop residue to the soil, using legume mixtures, and using conservation tillage methods.
- Reduce the risk of soil blowing by planting field windbreaks and maintaining a plant cover.
- Grazing when the soil is dry reduces compaction of the surface layer, maintains tilth, and prevents excessive runoff.
- Maintain the quality and quantity of forage by rotating grazing, mowing and clipping, controlling weeds, and fertilizing.

Windbreaks and Environmental Plantings

- Windbreaks are needed to limit soil losses, maintain optimum crop yields, protect farm and ranch buildings, and provide cover for wildlife.
- The trees and shrubs selected for planting should be suited to the conditions of the site.
- Irrigation should be provided for the establishment and maintenance of windbreaks.

Interpretive Groups

Land capability classification: Nonirrigated—6c

Range site: Loamy Bottom 5-8" p.z.

177—Notal silty clay loam, 1 to 3 percent slopes

Setting

Landform: Fan terraces

Shape of areas: Irregular

Size of areas: 10 to 500 acres

Elevation: 4,700 to 5,000 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Notal soil and similar soils: 85 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The occasionally flooded Ravola soil on narrow flood plains and small alluvial fans
- Notal soils which are strongly saline-sodic on small relict areas

Typical Profile

- 0 to 6 inches—light brownish gray silty clay loam
- 6 to 11 inches—light brownish gray silty clay loam
- 11 to 70 inches—light brownish gray silty clay

Soil Properties and Qualities

Parent material: Alluvium derived from shale

Depth class: Very deep

Drainage class: Well drained

Permeability: Very slow

Available water capacity: Moderate to high

Water intake rate: Slow

Surface runoff: Medium

Hazard of water erosion: Moderate

Hazard of soil blowing: Severe

Salinity: Moderately saline

Sodicity: Moderately sodic

Corrosion potential: High

Shrink-swell potential: Moderate

Major Uses

Livestock grazing

Irrigated cropland and pasture

Urban development

Livestock grazing

Dominant vegetation in potential plant community:
alkali sacaton, mound saltbush, galleta, black
greasewood

*Annual production of air-dry vegetation (pounds per
acre):*

Favorable years—600

Unfavorable years—400

Present plant community:

mound saltbush, alkali sacaton, Russian-thistle,
black greasewood

Major limitations: hazard of soil blowing

Suitable management practices and concerns:

- Continuous, intensive year-round grazing commonly results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly

locating watering facilities, properly distributing salt licks, and proper stocking.

- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Irrigated cropland and pasture

Suitable crops: alfalfa for hay, grasses and legumes
for pasture

Major limitations: salinity, sodicity, slow water intake
rate, permeability, hazard of soil blowing

Suitable management practices and concerns:

- The salinity and sodicity of the soil limit the kinds of crops that can be grown.
- The concentration of soluble salts and sodium limits the production of some hay and pasture plants.
- Most climatically suited crops can be grown if the concentration of soluble salts can be reduced by leaching.
- Reduce the content of salts and sodium by carefully applying irrigation water.
- Suitable irrigation systems are furrow, border, corrugation, and sprinkler.
- Land leveling is needed for uniform application of water with furrow, border, and corrugation methods.
- Use pipes, ditch linings, or drop structures in irrigation ditches to facilitate irrigation and reduce the risk of ditch erosion.
- A plowpan forms if the soil is excessively cultivated.
- All crops but legumes respond to nitrogen. Legumes respond to phosphorus.
- Irrigate at a rate that insures optimum production but does not increase deep percolation, runoff, and erosion.
- Maintain tilth by returning crop residue to the soil, using legume mixtures, and using conservation tillage methods.
- Reduce the risk of soil blowing by planting field windbreaks and maintaining a plant cover.
- Grazing when the soil is dry reduces compaction of the surface layer, maintains tilth, and prevents excessive runoff.
- Maintain the quality and quantity of forage by rotating grazing, mowing and clipping, controlling weeds, and fertilizing.

Urban development

Major limitations: permeability, shrink-swell potential,
salinity, corrosivity, hazard of soil blowing, soil
piping

Suitable management practices and concerns:

- Septic tank absorption fields will function poorly because of the very slow permeability of the soil.
- Increase the size of the septic tank absorption area to compensate for the restricted soil permeability.
- If the density of housing is moderate to high, a community sewage system will be needed to prevent pollution of the ground water.
- The quality of roadbeds and road surfaces can be adversely affected by shrinking and swelling of the soil.
- Some areas of this unit may be subject to salt heaving because of the expansion of sodium sulfate salts. This action is likely to crack concrete slab floors, driveways, and sidewalks.
- Prevent structural damage that results from shrinking and swelling and salt heaving by designing foundation and footings to allow for these hazards and by diverting runoff away from buildings.
- Offset the risk of corrosion to uncoated steel and concrete by using corrosion-resistant materials for foundations and underground utilities.
- Provide an adequate wearing surface on roads to reduce the amount of dust and lower maintenance costs.
- Install culverts to carry seasonal runoff where roads cross natural drainageways.

Windbreaks and Environmental Plantings

- Windbreaks are needed to limit soil losses, maintain optimum crop yields, protect farm and ranch buildings, and provide cover for wildlife.
- The trees and shrubs selected for planting should be suited to the conditions of the site.
- Irrigation should be provided for the establishment and maintenance of windbreaks.

Interpretive Groups

Land capability classification: Nonirrigated—7c, irrigated—3s

Range site: Clay Loam Terrace (sodic) 5-8" p.z.

180—Kimbeto-Huerfano complex, 1 to 4 percent slopes**Setting**

Landform: Cuestas and knolls southwest of the Hogback

Position on the landform: **Kimbeto**—dipslopes; **Huerfano**—toeslopes

Slope: **Kimbeto**—1 to 4 percent; **Huerfano**—1 to 3 percent

Shape of areas: Irregular

Size of areas: 200 to 5,000 acres

Elevation: 5,400 to 5,700 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Kimbeto loamy fine sand and similar soils: 40 percent
Huerfano fine sandy loam and similar soils: 40 percent

Contrasting inclusions: 20 percent

Contrasting Inclusions

- The very shallow Farb soil on upper portions of dipslopes of cuestas
- The fine textured Genats and Chipeta soils on scarp faces of cuestas
- Rock outcrop of sandstone and badland of soft shale on scarp faces of cuestas and remnant hills

Characteristics of the Kimbeto Soil*Typical profile:*

- 0 to 9 inches—light yellowish brown loamy fine sand
- 9 to 17 inches—light yellowish brown fine sandy loam
- 17 to 25 inches—light yellowish brown sandy clay loam
- 25 to 32 inches—very pale brown loam
- 32 to 44 inches—pale yellow and light yellowish brown fine sandy loam and loam
- 44 inches—soft sandstone bedrock

Parent material: Eolian material, alluvium, and residuum derived from sandstone

Depth class: Deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Low to moderate

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Very severe

Salinity: Slightly saline below a depth of 25 inches

Sodicity: Moderately sodic below a depth of 25 inches

Characteristics of the Huerfano Soil*Typical profile:*

- 0 to 2 inches—light yellowish brown fine sandy loam
- 2 to 9 inches—yellowish brown and light brown clay loam and sandy clay loam
- 9 to 18 inches—light yellowish brown clay loam
- 18 inches—interbedded shale and soft sandstone bedrock

Parent material: Alluvium and residuum derived from sandstone and shale

Depth class: Shallow

Drainage class: Well drained

Permeability: Moderately slow

Available water capacity: Very low

Surface runoff: Medium

Hazard of water erosion: Moderate

Hazard of soil blowing: Severe

Salinity: Moderately saline below a depth of 9 inches

Sodicity: Strongly sodic between 2 and 9 inches

Major Uses

Livestock grazing

Kimбето soil

Dominant vegetation in potential plant community:

alkali sacaton, Indian ricegrass, shadscale, galleta

Annual production of air-dry vegetation (pounds per acre):

Favorable years—550

Unfavorable years—350

Present plant community:

alkali sacaton, galleta, shadscale, Indian ricegrass, Russian-thistle

Huerfano soil

Dominant vegetation in potential plant community:

alkali sacaton, mound saltbush, ribscale, galleta,

Indian ricegrass

Annual production of air-dry vegetation (pounds per acre):

Favorable years—500

Unfavorable years—300

Present plant community:

alkali sacaton, ribscale, Russian-thistle, mound saltbush

Major limitations:

Kimбето—hazard of soil blowing

Huerfano—hazard of soil blowing, hazard of water erosion

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing and water erosion

by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Kimбето**—

nonirrigated—7c; **Huerfano**—nonirrigated—7s

Range site: **Kimбето**—Sandy Loam Upland (saline) 5-8" p.z.; **Huerfano**—Loamy Upland (sodic) 5-8" p.z.

183—Gyptur loam, 3 to 15 percent slopes

Setting

Landform: Dissected fan terraces

Shape of areas: Irregular

Size of areas: 10 to 200 acres

Elevation: 4,800 to 5,000 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Gyptur soil and similar soils: 85 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- Gullied land on 15 to 30 percent slopes
- Gyptur soils that have gravelly or cobbly surfaces
- Gyptur soils on 1 to 3 percent slopes east of Cudei

Typical Profile

- 0 to 2 inches—pale brown loam
- 2 to 25 inches—light yellowish brown gypsiferous material which is an apparent silty clay loam and silt loam
- 25 to 65 inches—light yellowish brown silt loam and loam

Soil Properties and Qualities

Parent material: Alluvium derived from siltstone and shale

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately slow

Available water capacity: Low to moderate

Surface runoff: Medium

Hazard of water erosion: Very severe

Hazard of soil blowing: Severe

Salinity: Strongly saline

Sodicity: Moderately sodic

Corrosion potential: High

Major Uses

Livestock grazing
Urban development

Livestock grazing

Dominant vegetation in potential plant community:

Indian ricegrass, alkali sacaton, galleta, bottlebrush squirreltail, Castle Valley clover, shadscale

Annual production of air-dry vegetation (pounds per acre):

Favorable years—500

Unfavorable years—300

Present plant community:

Castle Valley clover, galleta, cheatgrass, Russian-thistle, hairy coldenia

Major limitations: hazard of soil blowing, hazard of water erosion

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Urban development

Major limitations: permeability, soil piping, salinity, hazard of soil blowing, hazard of water erosion, corrosivity

Suitable management practices and concerns:

- Septic tank absorption fields may function poorly because of the presence of excess gypsum and the moderately slow permeability of the soil.
- Increase the size of septic tank absorption fields to compensate for the restricted soil permeability.
- If the density of housing is moderate to high, a community sewage system will be needed to prevent pollution of the ground water.
- This unit may be subject to salt heaving because of the expansion of sodium sulfate salts. This action is likely to crack concrete slab floors, driveways, and sidewalks.
- Prevent structural damage that results from salt

heaving by designing foundations and footings to allow for heaving and by diverting runoff away from buildings.

- The quality of roadbeds and road surfaces can be adversely affected by salt heaving.
- Local roads and streets may require a special base to prevent salt heave damage.
- Excavation can expose soil material that is highly susceptible to blowing.
- Preserve the existing plant cover during construction activities to reduce the risk of soil blowing and water erosion.
- Provide an adequate wearing surface on roads to reduce the amount of dust and lower maintenance costs.
- Offset the risk of corrosion to uncoated steel and concrete by using corrosion-resistant materials for foundations and underground utilities.
- Install culverts to carry seasonal runoff where roads cross natural drainageways.

Interpretive Groups

Land capability classification: Nonirrigated—7c

Range site: Silty Upland (sodic) 5-8" p.z.

190—Jeddito loamy fine sand, 0 to 2 percent slopes

Setting

Landform: Low stream terraces

Shape of areas: Irregular

Size of areas: 20 to 350 acres

Elevation: 5,500 to 6,000 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Jeddito soil and similar soils: 85 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The frequently flooded Hamburn and Escavada soils on small, narrow flood plains
- The moderately fine textured Tewa soil on fan terraces

Typical Profile

- 0 to 5 inches—light brown loamy fine sand
- 5 to 16 inches—brown loamy sand
- 16 to 70 inches—brown and light brown stratified loamy sand to clay loam

Soil Properties and Qualities

Parent material: Alluvium derived from sandstone and shale

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately slow

Available water capacity: Moderate

Water intake rate: Rapid

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Very severe

Flooding frequency: Rare

Corrosion potential: High for steel, moderate for concrete

Major Uses

Livestock grazing

Irrigated cropland and pasture

Urban development

Livestock grazing

Dominant vegetation in potential plant community:

Indian ricegrass, fourwing saltbush, galleta, blue grama, alkali sacaton, sand dropseed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—600

Unfavorable years—400

Present plant community:

galleta, sand dropseed, fourwing saltbush, Russian-thistle, annual weeds

Major limitations: hazard of soil blowing

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Irrigated cropland and pasture

Suitable crops: alfalfa, melons, corn, grasses and legumes for pasture

Major limitations: lack of dependable irrigation water, rapid water intake rate, hazard of soil blowing

Suitable management practices and concerns:

- Suitable irrigation systems are furrow, border, and corrugation.
- Because the soil is droughty, light and frequent irrigation is recommended.
- Land leveling is needed for uniform application of water.
- All crops but legumes respond to nitrogen. Legumes respond to phosphorus.
- Use pipes, ditch linings, or drop structures in irrigation ditches to facilitate irrigation and reduce the risk of ditch erosion.
- Irrigate at a rate that insures optimum production but does not increase deep percolation, runoff, and erosion.
- Maintain tilth by returning crop residue to the soil, using legume mixtures, and using conservation tillage methods.
- Reduce the risk of soil blowing by planting field windbreaks and maintaining a plant cover.
- Maintain the quality and quantity of forage by rotating grazing, mowing and clipping, controlling weeds, and fertilizing.

Urban development

Major limitations: rare flooding, hazard of soil blowing, corrosivity

Suitable management practices and concerns:

- Reduce the hazard of flooding by locating structures above the expected flood level and away from washes.
- Install culverts to carry seasonal runoff where roads cross natural drainageways.
- This unit is a good source of roadfill.
- Excavation for roads and other purposes can expose soil material that is highly susceptible to wind erosion.
- Preserve the existing plant cover during construction activities to reduce the risk of soil blowing.
- Provide an adequate wearing surface on roads to reduce the amount of dust and lower maintenance costs.
- If the density of housing is moderate to high, a community sewage system will be needed to prevent pollution of the ground water.
- Offset the risk of corrosion to uncoated steel and concrete by using corrosion-resistant material for foundations and underground utilities.

Windbreaks and Environmental Plantings

- Windbreaks are needed to limit soil losses, maintain optimum crop yields, protect farm and ranch buildings, and provide cover for wildlife.
- The trees and shrubs selected for planting should be suited to the conditions of the site.
- Irrigation should be provided for the establishment and maintenance of windbreaks.

Interpretive Groups

Land capability classification: Nonirrigated—7c, irrigated—3e

Range site: Loamy Terrace 5-8" p.z.

195—Tewa fine sandy loam, 2 to 15 percent slopes**Setting**

Landform: Fan terraces below mesas and cuevas

Shape of areas: Elongate to collar-like

Size of areas: 200 to 2,000 acres

Elevation: 5,800 to 6,100 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Tewa soil and similar soils: 85 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The shallow Persayo soil on knolls
- The occasionally flooded Ravola soil on small flood plains
- Tewa soils which are overlain with up to 15 inches of loamy fine sand
- A soil that has horizons high in gypsum exposed at the surface adjacent to shale knolls

Typical Profile

- 0 to 3 inches—yellowish brown fine sandy loam
- 3 to 27 inches—light yellowish brown and pale brown fine sandy loam and loam
- 27 to 66 inches—pale brown fine sandy loam and sandy clay loam

Soil Properties and Qualities

Parent material: Alluvium derived from sandstone and shale

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Moderate to high

Surface runoff: Medium

Hazard of water erosion: Severe

Hazard of soil blowing: Severe

Salinity: Slightly saline below a depth of 27 inches

Sodicity: Slightly sodic below a depth of 27 inches

Major Uses**Livestock grazing**

Dominant vegetation in potential plant community:

galleta, Indian ricegrass, blue grama, alkali sacaton, bottlebrush squirreltail, fourwing saltbush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—550

Unfavorable years—350

Present plant community:

galleta, blue grama, alkali sacaton bottlebrush squirreltail, broom snakeweed, Russian-thistle

Major limitations: hazard of soil blowing, hazard of water erosion

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: Nonirrigated—7c

Range site: Loamy Upland 5-8" p.z.

200—Tocito silt loam, 1 to 3 percent slopes**Setting**

Landform: Fan terraces

Shape of areas: Irregular

Size of areas: 5 to 500 acres

Elevation: 4,800 to 5,100 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Tocito soil and similar soils: 85 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The fine textured, moderately sodic Notal soil in lower portions of the unit
- The moderately permeable Fruitland soil on fan terraces east of Shiprock

Typical Profile

- 0 to 6 inches—pale brown silt loam
- 6 to 12 inches—pale brown clay loam
- 12 to 16 inches—pale brown silty clay loam
- 16 to 28 inches—light brownish gray silt loam
- 28 to 70 inches—pale brown clay loam and silty clay loam

Soil Properties and Qualities

Parent material: Alluvium derived from siltstone and shale

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately slow

Available water capacity: High

Water intake rate: Slow

Surface runoff: Medium

Hazard of water erosion: Moderate

Hazard of soil blowing: Severe

Salinity: Slightly saline below a depth of 12 inches

Sodicity: Slightly sodic below a depth of 12 inches

Corrosion potential: High

Major Uses

Irrigated cropland and pasture

Urban development

Irrigated cropland and pasture

Suitable crops: alfalfa for hay, fruits, melons, corn, grasses and legumes for pasture

Major limitations: slow water intake rate, hazard of soil blowing, hazard of soil piping

Suitable management practices and concerns:

- Suitable irrigation systems are furrow, border, corrugation, and sprinkler.
- Land leveling is needed for uniform application of water with furrow, border, and corrugation methods.
- Use pipes, ditch linings, or drop structures in irrigation ditches to facilitate irrigation and reduce the risk of ditch erosion and soil piping.
- Irrigate at a rate that insures optimum production

but does not increase deep percolation, soil piping, runoff, and erosion.

- All crops but legumes respond to nitrogen.

Legumes respond to phosphorus.

- Maintain tilth by returning crop residue to the soil, using legume mixtures, and using conservation tillage methods.

- Reduce the risk of soil blowing by planting field windbreaks and maintaining a plant cover.

- Maintain the quality and quantity of forage by rotating grazing, mowing and clipping, controlling weeds, and fertilizing.

- Grazing when the soil is dry reduces compaction of the surface layer, maintains tilth, and prevents excessive runoff.

Urban development

Major limitations: permeability, soil piping, hazard of soil blowing, corrosivity

Suitable management practices and concerns:

- Septic tank absorption fields may function poorly because of the restricted permeability of the soil.
- Increase the size of septic tank absorption fields to compensate for the restricted permeability, minimize solution of gypsum, and reduce soil piping.
- If the density of housing is moderate to high, a community sewage system will be needed to prevent pollution of the ground water.
- Preserve the existing plant cover during construction activities to reduce the risk of soil blowing.
- Offset the risk of corrosion to uncoated steel and concrete by using corrosion-resistant material for foundations and underground utilities.
- Provide an adequate wearing surface on roads to reduce the amount of dust and lower maintenance costs.
- Install culverts to carry seasonal runoff where roads cross natural drainageways.

Windbreaks and Environmental Plantings

- Windbreaks are needed to limit soil losses, maintain optimum crop yields, protect farm and ranch buildings, and provide cover for wildlife.
- The trees and shrubs selected for planting should be suited to the conditions of the site.
- Irrigation should be provided for the establishment and maintenance of windbreaks.

Interpretive Groups

Land capability classification: Nonirrigated—7c, irrigated—3e

Range site: Clay Loam Terrace (sodic) 5-8" p.z.

205—Shiprock-Farb complex, 1 to 5 percent slopes

Setting

Landform: Undulating plateaus and cuestas

Position on the landform: **Shiprock**—eolian-mantled summits and dipslopes; **Farb**—summits and dipslopes

Slope: **Shiprock**—1 to 5 percent; **Farb**—1 to 5 percent

Shape of areas: Irregular

Size of areas: 1,000 to 3,500 acres

Elevation: 5,500 to 6,100 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Shiprock loamy fine sand and similar soils: 70 percent

Farb fine sand and similar soils: 15 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The coarse textured Razito soil on stable dunes
- Shiprock soils which have surfaces with 10 to 20 inches of fine sand on hummocky, eolian-mantled summits
- Rock outcrop of sandstone on dipslopes of cuestas
- Soils similar to Nageezi which have more clay on stream terraces in shallow valleys

Characteristics of the Shiprock Soil

Typical profile:

- 0 to 3 inches—light brown loamy fine sand
- 3 to 36 inches—brown fine sandy loam
- 36 to 66 inches—brown fine sandy loam

Parent material: Eolian material and alluvium derived from sandstone

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately rapid

Available water capacity: Moderate to high

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Very severe

Salinity: Slightly saline below a depth of 36 inches

Sodicity: Slightly sodic below a depth of 36 inches

Characteristics of the Farb Soil

Typical profile:

- 0 to 2 inches—light brown fine sand

- 2 to 10 inches—brown fine sandy loam

- 10 inches—sandstone bedrock

Parent material: Eolian material and alluvium derived from sandstone

Depth class: Very shallow

Drainage class: Well drained

Permeability: Moderately rapid

Available water capacity: Very low

Surface runoff: Slow

Hazard of water erosion: Moderate

Hazard of soil blowing: Very severe

Major Uses

Livestock grazing

Shiprock soil

Dominant vegetation in potential plant community:

Indian ricegrass, galleta, blue grama, sand dropseed, fourwing saltbush, broom snakeweed, Greene rabbitbrush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—550

Unfavorable years—300

Present plant community:

Indian ricegrass, galleta, blue grama, broom snakeweed, fourwing saltbush, Greene rabbitbrush

Farb soil

Dominant vegetation in potential plant community:

Indian ricegrass, galleta, Bigelow sagebrush, New Mexico feathergrass, blue grama, bottlebrush squirreltail, Torrey Mormon tea, broom snakeweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—200

Unfavorable years—100

Present plant community:

New Mexico feathergrass, galleta, Indian ricegrass, blue grama, broom snakeweed, Bigelow sagebrush, Greene rabbitbrush

Major limitations:

Shiprock—hazard of soil blowing

Farb—hazard of soil blowing, depth to bedrock

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.

- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Shiprock**—nonirrigated—7c; **Farb**—nonirrigated—7s

Range site: **Shiprock**—Sandy Loam Upland 5-8" p.z.; **Farb**—Sandstone Upland 5-8" p.z.

210—Mack-Mesa fine sandy loams, 1 to 4 percent slopes

Setting

Landform: High stream terraces and fan terraces

Position on the landform: **Mack**—planar areas on treads; **Mesa**—convex areas on treads

Shape of areas: Irregular

Size of areas: 250 to 2,000 acres

Elevation: 5,700 to 6,300 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Mack soil and similar soils: 55 percent

Mesa soil and similar soils: 35 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- The slightly saline and slightly sodic Tewa soil throughout the unit
- The moderately coarse textured Nageezi soil throughout the unit
- The moderately deep Camac soil on risers of terraces
- The rarely flooded Jeddito soil on low stream terraces

Characteristics of the Mack Soil

Typical profile:

- 0 to 2 inches—brown fine sandy loam
- 2 to 8 inches—brown sandy loam
- 8 to 24 inches—light brown sandy clay loam
- 24 to 65 inches—pinkish white, pink, and light brown sandy loam

Parent material: Alluvium and eolian material derived from sandstone and shale

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Moderate to high

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Severe

Characteristics of the Mesa Soil

Typical profile:

- 0 to 3 inches—brown fine sandy loam
 - 3 to 32 inches—brown sandy clay loam and gravelly sandy clay loam
 - 32 to 57 inches—pink and pinkish white very cobbly sandy loam
 - 57 to 64 inches—pink very gravelly sandy loam
- Parent material:* Alluvium and eolian material derived from sandstone and shale

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Moderate

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Severe

Major Uses

Livestock grazing

Mack soil

Dominant vegetation in potential plant community: galleta, Indian ricegrass, blue grama, bottlebrush squirreltail, fourwing saltbush, sand dropseed, Greene rabbitbrush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—550

Unfavorable years—350

Present plant community:

galleta, blue grama, fourwing saltbush, Greene rabbitbrush

Mesa soil

Dominant vegetation in potential plant community: galleta, Indian ricegrass, blue grama, bottlebrush squirreltail, fourwing saltbush, sand dropseed, winterfat, Greene rabbitbrush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—550

Unfavorable years—350

Present plant community:

blue grama, galleta, Greene rabbitbrush, fourwing saltbush, winterfat, Indian ricegrass

Major limitations: hazard of soil blowing

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Mack**—nonirrigated—7c; **Mesa**—nonirrigated—7c

Range site: **Mack**—Loamy Upland 5-8" p.z.; **Mesa**—Loamy Upland 5-8" p.z.

215—Persayo-Fordbutte association, 1 to 10 percent slopes

Setting

Landform: Undulating plateaus and cuestas

Position on the landform: **Persayo**—knolls, footslopes, and dipslopes; **Fordbutte**—toeslopes

Slope: **Persayo**—1 to 10 percent; **Fordbutte**—1 to 3 percent

Shape of areas: Irregular

Size of areas: 100 to 2,000 acres

Elevation: 5,300 to 6,300 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Persayo very fine sandy loam and similar soils: 55 percent

Fordbutte very fine sandy loam and similar soils: 30 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- Moderately deep soils that have horizons high in gypsum exposed at the surface between Rock Mesa and Sanostee, and near Yellow Hill
- Persayo soils on 10 to 25 percent slopes throughout the unit
- The very deep, occasionally flooded Ravola soil on small flood plains

- The very shallow Farb soil on dipslopes of cuestas east of Tocito Dome
- The strongly sodic Littlehat soil on areas mapped adjacent to map unit 250
- The gypsiferous Nataani soil on areas mapped adjacent to map unit 250

Characteristics of the Persayo Soil*Typical profile:*

- 0 to 2 inches—light yellowish brown very fine sandy loam
- 2 to 18 inches—light brownish gray and light yellowish brown loam
- 18 inches—siltstone bedrock

Parent material: Alluvium and residuum derived from siltstone

Depth class: Shallow

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Very low

Surface runoff: Medium

Hazard of water erosion: Very severe

Hazard of soil blowing: Severe

Salinity: Moderately saline

Sodicity: Slightly sodic

Characteristics of the Fordbutte Soil*Typical profile:*

- 0 to 4 inches—light yellowish brown very fine sandy loam
- 4 to 26 inches—light yellowish brown loam
- 26 to 34 inches—light yellowish brown loam
- 34 inches—siltstone bedrock

Parent material: Alluvium and residuum derived from siltstone

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Moderate

Surface runoff: Medium

Hazard of water erosion: Moderate

Hazard of soil blowing: Severe

Salinity: Slightly saline

Sodicity: Moderately sodic

Major Uses**Livestock grazing****Persayo soil**

Dominant vegetation in potential plant community: alkali sacaton, sickle saltbush, Indian ricegrass, galleta, gyp dropseed, shadscale

Annual production of air-dry vegetation (pounds per acre):

Favorable years—300

Unfavorable years—100

Present plant community:

alkali sacaton, Indian ricegrass, galleta, sickle saltbush, shadscale, Russian-thistle

Fordbutte soil

Dominant vegetation in potential plant community:

alkali sacaton, shadscale, Indian ricegrass, galleta, bottlebrush squirreltail, sickle saltbush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—550

Unfavorable years—350

Present plant community:

alkali sacaton, galleta, Indian ricegrass, shadscale, sickle saltbush, Russian-thistle

Major limitations:

Persayo—hazard of soil blowing, hazard of water erosion, depth to bedrock

Fordbutte—hazard of soil blowing, hazard of water erosion

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Persayo**—

nonirrigated—7s; **Fordbutte**—nonirrigated—7c

Range site: **Persayo**—Silty Shallow 5-8" p.z.;

Fordbutte—Sandy Loam Upland (saline) 5-8" p.z.

220—Chinde loam, 0 to 5 percent slopes

Setting

Landform: Toeslopes and knolls of undulating plateaus

Shape of areas: Irregular

Size of areas: 50 to 1,200 acres

Elevation: 5,200 to 5,600 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Chinde soil and similar soils: 85 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The shallow Chipeta soil on knolls
- The moderately deep Littlehat soil on knolls
- The moderately fine textured Benally soil on treads of high stream terraces

Typical Profile

- 0 to 2 inches—light yellowish brown loam
- 2 to 9 inches—yellowish brown gypsiferous material which is an apparent clay loam
- 9 to 33 inches—yellowish brown and light olive clay
- 33 to 64 inches—olive brown clay

Soil Properties and Qualities

Parent material: Alluvium derived from shale

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately slow

Available water capacity: Low to moderate

Surface runoff: Medium

Hazard of water erosion: Moderate

Hazard of soil blowing: Severe

Salinity: Strongly saline

Sodicity: Strongly sodic

Shrink-swell potential: High

Major Uses

Livestock grazing

Dominant vegetation in potential plant community:

mat saltbush, alkali sacaton, Indian ricegrass, bottlebrush squirreltail, sickle saltbush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—200

Unfavorable years—100

Present plant community:

mat saltbush, alkali sacaton, Russian-thistle

Major limitations: hazard of soil blowing, hazard of water erosion, shrink-swell potential, salinity

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.

- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: Nonirrigated—7s

Range site: Saline-Sodic Upland 5-8" p.z.

230—Ravola very fine sandy loam, 1 to 3 percent slopes

Setting

Landform: Alluvial fans and braided flood plains

Shape of areas: Elongated

Size of areas: 200 to 1,000 acres

Elevation: 4,900 to 6,000 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Ravola soil and similar soils: 80 percent

Contrasting inclusions: 20 percent

Contrasting Inclusions

- Soils similar to Ravola which are frequently flooded in low channels throughout the unit
- Moderately fine textured soils which contain gypsum and are slightly to moderately sodic in areas of this unit between the Hogback and the Chaco River

Typical Profile

- 0 to 10 inches—pale brown and light yellowish brown very fine sandy loam
- 10 to 70 inches—stratified light yellowish brown and pale brown loam and very fine sandy loam

Soil Properties and Qualities

Parent material: Alluvium derived from siltstone

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: High to very high

Surface runoff: Medium

Hazard of water erosion: Moderate

Hazard of soil blowing: Severe

Flooding frequency: Occasional, very brief periods

Major Uses

Livestock grazing

Dominant vegetation in potential plant community:

alkali sacaton, galleta, Indian ricegrass, mound

saltbush, sickle saltbush, bottlebrush squirreltail

Annual production of air-dry vegetation (pounds per acre):

Favorable years—600

Unfavorable years—400

Present plant community:

alkali sacaton, galleta, Russian-thistle, sickle

saltbush, mound saltbush, Castle Valley clover

Major limitations: hazard of soil blowing, hazard of water erosion, occasional flooding

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: Nonirrigated—7c

Range site: Silty Fan 5-8" p.z.

235—Wingrock-Rock outcrop association, 4 to 15 percent slopes

Setting

Landform: Volcanic necks and adjacent fan terraces

Position on the landform: **Wingrock**—fan terraces;

Rock outcrop—cliffs, spires, knobs

Shape of areas: Irregular

Size of areas: 25 to 1,500 acres

Elevation: 5,200 to 6,000 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Wingrock gravelly loamy sand and similar soils: 55 percent

Rock outcrop: 25 percent

Contrasting inclusions: 20 percent

Contrasting Inclusions

- Small areas of very gravelly, moderately coarse textured soils which range from shallow to deep, and formed in colluvium and residuum on 50 to 70 percent slopes
- Deep, medium textured soils that have gravelly surfaces, on 25 to 60 percent slopes below the west and south dike intrusions of the Ship Rock
- Badland of barren siltstone bedrock associated with dike intrusions

Characteristics of the Wingrock Soil

Typical profile:

- 0 to 5 inches—brown gravelly loamy sand
- 5 to 12 inches—brown sandy loam
- 12 to 36 inches—brown and pale brown stratified gravelly loamy coarse sand to sandy loam
- 36 to 70 inches—pale brown sandy loam

Parent material: Alluvium derived from tuff-breccia and sandstone

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately rapid

Available water capacity: Low to moderate

Surface runoff: Medium

Hazard of water erosion: Moderate

Hazard of soil blowing: Severe

Salinity: Slightly saline below a depth of 36 inches

Sodicity: Slightly sodic below a depth of 36 inches

Characteristics of Rock outcrop

Rock outcrop consists dominantly of exposures of tuff-breccia and basalt bedrock on vertical cliffs, spires, and knobs above the Wingrock soil. There is little or no vegetation, and surface runoff is very rapid.

Major Uses

Livestock grazing

Dominant vegetation in potential plant community:

alkali sacaton, Indian ricegrass, shadscale, galleta

Annual production of air-dry vegetation (pounds per acre):

Favorable years—550

Unfavorable years—350

Present plant community:

alkali sacaton, galleta, Russian-thistle, shadscale

Major limitations: hazard of soil blowing, hazard of water erosion

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, and using proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Wingrock**—

nonirrigated—7c; **Rock outcrop**—nonirrigated—8s

Range site: **Wingrock**—Sandy Loam Upland (saline) 5-8" p.z.; **Rock outcrop**—not assigned

240—Nageezi loamy fine sand, 1 to 6 percent slopes

Setting

Landform: Treads of high stream terraces and fan terraces

Shape of areas: Irregular

Size of areas: 50 to 2,500 acres

Elevation: 4,700 to 5,300 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Nageezi soil and similar soils: 80 percent

Contrasting inclusions: 20 percent

Contrasting Inclusions

- The shallow Persayo soil on low knolls
- The coarse textured Razito soil on stable linear dunes
- The strongly sodic, moderately fine textured Benally and Gyptur soils on toeslopes

Typical Profile

- 0 to 2 inches—light brown loamy fine sand
- 2 to 12 inches—light brown fine sandy loam

- 12 to 42 inches—light brown and pink fine sandy loam
- 42 to 64 inches—light brown loamy sand

Soil Properties and Qualities

Parent material: Alluvium and eolian material derived from sandstone

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately rapid

Available water capacity: Moderate

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Very severe

Salinity: Slightly saline below a depth of 42 inches

Sodicity: Slightly sodic below a depth of 32 inches

Major Uses

Livestock grazing

Dominant vegetation in potential plant community:

Indian ricegrass, galleta, sand dropseed, bottlebrush squirreltail, winterfat, fourwing saltbush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—550

Unfavorable years—300

Present plant community:

Indian ricegrass, broom snakeweed, galleta, Fendler threeawn, sand dropseed

Major limitations: hazard of soil blowing

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: Nonirrigated—7c

Range site: Sandy Loam Upland 5-8" p.z.

245—Tsebitai very fine sandy loam, 1 to 3 percent slopes

Setting

Landform: Fan terraces below mesas, cuestas, and buttes

Shape of areas: Irregular

Size of areas: 200 to 1,000 acres

Elevation: 5,300 to 5,500 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Tsebitai soil and similar soils: 80 percent

Contrasting inclusions: 20 percent

Contrasting Inclusions

- The occasionally flooded Ravola soil in headwater portions of flood plains
- The shallow Persayo soil and moderately deep Fordbutte soil associated with bedrock knolls throughout the unit

Typical Profile

- 0 to 5 inches—pale brown very fine sandy loam
- 5 to 26 inches—pale brown loam
- 26 to 64 inches—pale brown loam

Soil Properties and Qualities

Parent material: Alluvium derived from siltstone and sandstone

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: High

Surface runoff: Slow

Hazard of water erosion: Moderate

Hazard of soil blowing: Severe

Salinity: Slightly saline below a depth of 34 inches

Major Uses

Livestock grazing

Dominant vegetation in potential plant community:

Indian ricegrass, alkali sacaton, Castle Valley clover, sand dropseed, galleta, bottlebrush squirreltail

Annual production of air-dry vegetation (pounds per acre):

Favorable years—550

Unfavorable years—350

Present plant community:

Indian ricegrass, alkali sacaton, Castle Valley clover, galleta, cheatgrass, Russian-thistle

Major limitations: hazard of soil blowing

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: Nonirrigated—7c

Range site: Silty Upland 5-8" p.z.

250—Littlehat-Persayo-Nataani complex, 1 to 15 percent slopes

Setting

Landform: Undulating plateaus (fig. 6)

Position on the landform: **Littlehat**—summits and footslopes; **Persayo**—toeslopes, and dipslopes of cuestas; **Nataani**—toeslopes

Slope: **Littlehat**—1 to 15 percent; **Persayo**—1 to 5 percent; **Nataani**—1 to 5 percent

Shape of areas: Irregular

Size of areas: 20 to 3,000 acres

Elevation: 5,000 to 5,600 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Littlehat silt loam and similar soils: 35 percent

Persayo very fine sandy loam and similar soils: 30 percent

Nataani very fine sandy loam and similar: 20 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The occasionally flooded Ravola soil on narrow flood plains

- The very deep Tsebitai soil on fan terraces
- The deep Gyptur soil on long toeslopes and summits of small structural benches

Characteristics of the Littlehat Soil

Typical profile:

- 0 to 2 inches—light yellowish brown silt loam
- 2 to 10 inches—light yellowish brown silt loam
- 10 to 31 inches—grayish brown and light brownish gray silt loam
- 31 inches—siltstone bedrock

Parent material: Alluvium and residuum derived from siltstone and shale

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Very low

Surface runoff: Rapid

Hazard of water erosion: Very severe

Hazard of soil blowing: Severe

Salinity: Strongly saline below a depth of 10 inches

Sodicity: Strongly sodic below a depth of 2 inches

Characteristics of the Persayo Soil

Typical profile:

- 0 to 2 inches—light yellowish brown very fine sandy loam
- 2 to 6 inches—very pale brown loam
- 6 to 17 inches—light yellowish brown clay loam
- 17 inches—siltstone bedrock

Parent material: Alluvium and residuum derived from siltstone and shale

Depth class: Shallow

Drainage class: Well drained

Permeability: Moderately slow

Available water capacity: Very low

Surface runoff: Medium

Hazard of water erosion: Moderate

Hazard of soil blowing: Severe

Salinity: Moderately saline

Sodicity: Slightly sodic

Characteristics of the Nataani Soil

Typical profile:

- 0 to 3 inches—light yellowish brown very fine sandy loam
- 3 to 9 inches—light yellowish brown loam
- 9 to 21 inches—light gray and light yellowish brown gypsiferous material which is an apparent silt loam
- 21 to 30 inches—light yellowish brown silt loam
- 30 inches—siltstone bedrock

Parent material: Alluvium and residuum derived from siltstone

Depth class: Moderately deep



Figure 6.—An area of Littlehat-Persayo-Nataani complex, 1 to 15 percent slopes, north of Shiprock, New Mexico. Tsebitai very fine sandy loam, 1 to 3 percent slopes, is in the middle ground. Badland-Rock outcrop complex is on Blue Hill and Skinney Rock in the background. Many species of saltbush are common in this part of major land resource area 37.

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Very low to low

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Severe

Salinity: Moderately saline below a depth of 16 inches

Sodicity: Slightly sodic below a depth of 16 inches

Major Uses

Livestock grazing

Littlehat soil

Dominant vegetation in potential plant community:

mat saltbush, alkali sacaton, Indian ricegrass,

bottlebrush squirreltail, Castle Valley clover

Annual production of air-dry vegetation (pounds per acre):

Favorable years—200

Unfavorable years—100

Present plant community:

mat saltbush, Indian ricegrass, globemallow, scorpion weed

Persayo soil

Dominant vegetation in potential plant community:

Castle Valley clover, Indian ricegrass, galleta, bud sagebrush, bottlebrush squirreltail

Annual production of air-dry vegetation (pounds per acre):

Favorable years—350

Unfavorable years—150

Present plant community:

Indian ricegrass, cheatgrass, galleta, bottlebrush squirreltail, Castle Valley clover, bud sagebrush

Nataani soil

Dominant vegetation in potential plant community:

Indian ricegrass, alkali sacaton, Castle Valley clover, galleta, sand dropseed, bottlebrush squirreltail

Annual production of air-dry vegetation (pounds per acre):

Favorable years—550

Unfavorable years—350

Present plant community:

Indian ricegrass, galleta, Castle Valley clover, cheatgrass, bottlebrush squirreltail, winterfat

Major limitations:

Littlehat—hazard of water erosion, hazard of soil blowing, salinity

Persayo—hazard of soil blowing, hazard of water erosion, depth to bedrock

Nataani—hazard of soil blowing

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of water erosion and soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Littlehat**—

nonirrigated—7s; **Persayo**—nonirrigated—7s;

Nataani—nonirrigated—7c

Range site: **Littlehat**—Saline-Sodic Upland 5-8" p.z.;

Persayo—Silty Shallow (calcareous) 5-8" p.z.;

Nataani—Silty Upland 5-8" p.z.

255—Benally fine sandy loam, 1 to 5 percent slopes

Setting

Landform: Toeslopes and summits of undulating plateaus and on terraces

Shape of areas: Irregular

Size of areas: 75 to 1,500 acres

Elevation: 5,100 to 5,500 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Benally soil and similar soils: 80 percent

Contrasting inclusions: 20 percent

Contrasting Inclusions

- The flooded Ravola and Hamburn soils on small flood plains
- The strongly saline-sodic Chinde soil on toeslopes
- The fine textured Hoskay soil on areas of this map unit that border Colorado
- The deep Kimbeto soil on areas of this unit that border Colorado
- Benally soils that have very gravelly and very cobbly surfaces on fan terraces along the San Juan River valley

Typical Profile

- 0 to 3 inches—light yellowish brown fine sandy loam
- 3 to 14 inches—light yellowish brown fine sandy loam and loam
- 14 to 41 inches—light yellowish brown clay loam
- 41 to 65 inches—light yellowish brown silty clay loam

Soil Properties and Qualities

Parent material: Alluvium derived from sandstone and shale

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately slow

Available water capacity: Very low to low

Surface runoff: Medium

Hazard of water erosion: Moderate

Hazard of soil blowing: Severe

Salinity: Strongly saline below a depth of 14 inches

Sodicity: Strongly sodic below a depth of 8 inches

Major Uses

Livestock grazing

Dominant vegetation in potential plant community: alkali sacaton, mound saltbush, ribscales, sickle saltbush, Indian ricegrass, galleta

Annual production of air-dry vegetation (pounds per acre):

Favorable years—500

Unfavorable years—300

Present plant community:

alkali sacaton, Russian-thistle, mound saltbush, ribscales, sickle saltbush, Indian ricegrass

Major limitations: hazard of soil blowing, hazard of water erosion

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: Nonirrigated—7s

Range site: Loamy Upland (sodic) 5-8" p.z.

260—Littlehat-Persayo-Badland complex, 3 to 45 percent slopes

Setting

Landform: Undulating plateaus

Position on the landform: **Littlehat**—summits, footslopes, and backslopes; **Persayo**—toeslopes and structural benches; **Badland**—backslopes

Slope: **Littlehat**—3 to 45 percent; **Persayo**—3 to 15 percent

Shape of areas: Irregular

Size of areas: 50 to 3,000 acres

Elevation: 5,000 to 5,500 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Littlehat silt loam and similar soils: 35 percent

Persayo silt loam and similar soils: 35 percent

Badland: 15 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The occasionally flooded Ravola soil on narrow flood plains

- The very deep Tocito soil on small fan terraces and low stream terraces

- Persayo soils which are very shallow to soft limestone bedrock in the Red Wash area

Characteristics of the Littlehat Soil*Typical profile:*

- 0 to 2 inches—light yellowish brown silt loam
- 2 to 36 inches—light yellowish brown silty clay loam
- 36 inches—siltstone bedrock

Parent material: Alluvium and residuum derived from siltstone and shale

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Very low to low

Surface runoff: Rapid

Hazard of water erosion: Very severe

Hazard of soil blowing: Severe

Salinity: Strongly saline below a depth of 2 inches

Sodicity: Strongly sodic below a depth of 2 inches

Characteristics of the Persayo Soil*Typical profile:*

- 0 to 2 inches—light yellowish brown silt loam
- 2 to 6 inches—light yellowish brown silt loam
- 6 to 18 inches—light yellowish brown silty clay loam
- 18 inches—siltstone bedrock

Parent material: Alluvium and residuum derived from siltstone and shale

Depth class: Shallow

Drainage class: Well drained

Permeability: Moderately slow

Available water capacity: Very low

Surface runoff: Medium

Hazard of water erosion: Very severe

Hazard of soil blowing: Severe

Salinity: Slightly saline

Sodicity: Slightly sodic

Characteristics of Badland

Badland consists of exposures of siltstone and shale bedrock. It occurs as steep, convex cones above areas of Littlehat and Persayo soils. There is little or no vegetation, and surface runoff is rapid.

Major Uses**Livestock grazing****Littlehat soil**

Dominant vegetation in potential plant community:

mat saltbush, alkali sacaton, Indian ricegrass,
bottlebrush squirreltail, Castle Valley clover
*Annual production of air-dry vegetation (pounds per
acre):*

Favorable years—200

Unfavorable years—100

Present plant community:

mat saltbush, Castle Valley clover, Indian ricegrass,
cheatgrass, globemallow

Persayo soil

Dominant vegetation in potential plant community:

Castle Valley clover, Indian ricegrass, galleta, bud
sagebrush, bottlebrush squirreltail

*Annual production of air-dry vegetation (pounds per
acre):*

Favorable years—350

Unfavorable years—150

Present plant community:

Indian ricegrass, alkali sacaton, Castle Valley clover,
bud sagebrush, mat saltbush

Major limitations:

Littlehat—hazard of water erosion, hazard of soil
blowing, salinity

Persayo—hazard of soil blowing, hazard of water
erosion, depth to bedrock

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of water erosion and soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Littlehat**—

nonirrigated—7s; **Persayo**—nonirrigated—7s;

Badland—nonirrigated—8s

Range site: **Littlehat**—Saline-Sodic Upland 5-8" p.z.;

Persayo—Silty Shallow (calcareous) 5-8" p.z.;

Badland—not assigned

265—Camac-Kimbeto-Badland association, 0 to 50 percent slopes

Setting

Landform: High stream terraces

Position on the landform: **Camac**—risers; **Kimbeto**—
treads; **Badland**—backslopes

Slope: **Camac**—15 to 50 percent; **Kimbeto**—0 to 5
percent

Shape of areas: Irregular

Size of areas: 20 to 3,000 acres

Elevation: 4,800 to 6,100 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Camac very cobbly fine sandy loam and similar soils:
35 percent

Kimbeto fine sandy loam and similar soils: 35 percent

Badland: 15 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The non-cobbly Littlehat and Persayo soils on hills between Shiprock and Red Wash
- The fine textured Hoskay soil on strongly sodic areas of treads
- The moderately permeable Benally soil on strongly sodic areas of treads
- The very cobbly Blackston soil on shoulders of terraces
- Rock outcrop of sandstone near the Hogback and west of Cudei

Characteristics of the Camac Soil

Typical profile:

- 0 to 3 inches—pale brown very cobbly fine sandy loam
- 3 to 16 inches—light yellowish brown gravelly fine sandy loam and gravelly sandy clay loam
- 16 to 34 inches—pale brown and grayish brown silt loam
- 34 inches—siltstone bedrock

Parent material: Alluvium derived from quartzite and
residuum derived from siltstone and shale

Depth class: Moderately deep

Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: Low
Surface runoff: Rapid
Hazard of water erosion: Severe
Hazard of soil blowing: Moderate
Salinity: Slightly saline below a depth of 16 inches
Sodicity: Slightly sodic below a depth of 16 inches

Characteristics of the Kimbeto Soil

Typical profile:

- 0 to 2 inches—light brown fine sandy loam
- 2 to 10 inches—brown loam
- 10 to 36 inches—pink loam
- 36 to 54 inches—pink fine sandy loam
- 54 to 66 inches—light brown cobbly sandy clay loam

Parent material: Alluvium derived from sandstone, shale, and quartzite

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Low

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Severe

Salinity: Moderately saline below a depth of 54 inches

Sodicity: Moderately sodic below a depth of 18 inches

Characteristics of Badland

Badland consists of exposures of siltstone and shale bedrock. It occurs as steep, convex cones and small vertical cliffs on backslopes. There is little or no vegetation, and surface runoff is rapid to very rapid.

Major Uses

Livestock grazing

Camac soil

Dominant vegetation in potential plant community:

galleta, Indian ricegrass, Castle Valley clover, shadscale, alkali sacaton, sand dropseed, bud sagebrush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—450

Unfavorable years—250

Present plant community:

galleta, cheatgrass, alkali sacaton, Indian ricegrass, Castle Valley clover, shadscale, bud sagebrush

Kimbeto soil

Dominant vegetation in potential plant community:

alkali sacaton, galleta, Indian ricegrass, shadscale
Annual production of air-dry vegetation (pounds per acre):

Favorable years—550

Unfavorable years—350

Present plant community:

galleta, Indian ricegrass, alkali sacaton, cheatgrass, shadscale, broom snakeweed

Major limitations:

Camac—hazard of soil blowing, hazard of water erosion, surface rock fragments, steep slopes

Kimbeto—hazard of soil blowing

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Livestock prefer to graze the easily accessible areas before they graze the steep slopes.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Camac**—nonirrigated—7e; **Kimbeto**—nonirrigated—7s; **Badland**—nonirrigated—8s

Range site: **Camac**—Cobbly Slopes 5-8" p.z.;

Kimbeto—Sandy Loam Upland (saline) 5-8" p.z.;

Badland—not assigned

270—Fruitland sandy clay loam, 1 to 3 percent slopes

Setting

Landform: Fan terraces

Shape of areas: Irregular

Size of areas: 25 to 220 acres

Elevation: 4,700 to 5,100 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Fruitland soil and similar soils: 85 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- Areas of Fruitland soils that have buried cobbly horizons between 40 and 70 inches
- The coarse textured Razito loamy sand soil throughout the unit
- Fruitland soils that have sandy loam surfaces throughout the unit
- The moderately fine textured Tocito soil on lower portions of fan terraces
- Urban land within the town of Shiprock

Typical Profile

- 0 to 7 inches—yellowish brown sandy clay loam
- 7 to 42 inches—yellowish brown and light yellowish brown fine sandy loam
- 42 to 65 inches—light yellowish brown sandy clay loam

Soil Properties and Qualities

Parent material: Alluvium derived from sandstone and siltstone

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: High

Water intake rate: Moderately slow

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Moderate

Salinity: Very slightly saline

Corrosion potential: High for steel, moderate for concrete

Major Uses

Irrigated cropland and pasture

Urban development

Irrigated cropland and pasture

Suitable crops: alfalfa for hay, fruits, melons, corn, grasses and legumes for pasture (fig. 7)

Major limitations: hazard of soil blowing

Suitable management practices and concerns:

- Suitable irrigation systems are furrow, border, corrugation, and sprinkler.
- Land leveling is needed for uniform application of water with furrow, border, and corrugation methods.
- Use pipes, ditch linings, or drop structures in irrigation ditches to facilitate irrigation and reduce the risk of ditch erosion.
- Irrigate at a rate that insures optimum production

but does not increase deep percolation, runoff, and erosion.

- A plowpan forms if the soil is excessively cultivated.
- All crops but legumes respond to nitrogen. Legumes respond to phosphorus.
- Maintain tilth by returning crop residue to the soil, using legume mixtures, and using conservation tillage methods.
- Reduce the risk of soil blowing by planting field windbreaks and maintaining a plant cover.
- Grazing when the soil is dry reduces compaction of the surface layer, maintains tilth, and prevents excessive runoff.
- Maintain the quality and quantity of forage by rotating grazing, mowing and clipping, controlling weeds, and fertilizing.

Urban development

Major limitations: hazard of soil blowing, corrosivity
Suitable management practices and concerns:

- Septic systems should function well on this soil.
- If the density of housing is moderate to high, a community sewage system will be needed to prevent pollution of the ground water.
- This unit is a good source of roadfill.
- Excavation can expose soil material that is highly susceptible to wind erosion.
- Preserve the existing plant cover during construction activities to reduce the risk of soil blowing.
- Offset the risk of corrosion to uncoated steel and concrete by using corrosion-resistant materials for foundations and underground utilities.
- Provide an adequate wearing surface on roads to reduce the amount of dust and lower maintenance costs.
- Install culverts to carry seasonal runoff where roads cross natural drainageways.

Windbreaks and Environmental Plantings

- Windbreaks are needed to limit soil losses, maintain optimum crop yields, protect farm and ranch buildings, and provide cover for wildlife.
- The trees and shrubs selected for planting should be suited to the conditions of the site.
- Irrigation should be provided for the establishment and maintenance of windbreaks.

Interpretive Groups

Land capability classification: Nonirrigated—7c, irrigated—2e

Range site: Loamy Upland 5-8" p.z.

275—Razito loamy sand, 3 to 5 percent slopes

Setting

Landform: Fan terraces

Shape of areas: Irregular

Size of areas: 50 to 150 acres

Elevation: 4,700 to 5,200 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Razito soil and similar soils: 85 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- Razito soils that have sandy loam surfaces on older cropland
- Razito soils that have fine sand or loamy fine sand surfaces on eolian-mantled areas that have slopes up to 20 percent, near the Hogback

Typical Profile

- 0 to 6 inches—light yellowish brown loamy sand
- 6 to 70 inches—light yellowish brown loamy sand

Soil Properties and Qualities

Parent material: Alluvium derived from sandstone

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Rapid

Available water capacity: Low



Figure 7.— Windrowed and baled alfalfa hay on an area of Fruitland sandy clay loam, 1 to 3 percent slopes, along the San Juan River Valley in New Mexico. Three cuttings are possible in most years, with a fourth possible in some years.

Water intake rate: Rapid

Surface runoff: Slow

Hazard of water erosion: Moderate

Hazard of soil blowing: Very severe

Corrosion potential: High for steel, low for concrete

Major Uses

Irrigated cropland and pasture

Urban development

Irrigated cropland and pasture

Suitable crops: alfalfa for hay, fruit, melons, corn, grasses and legumes for pasture

Major limitations: rapid water intake rate, rapid permeability, low available water capacity, hazard of soil blowing

Suitable management practices and concerns:

- Suitable irrigation systems are furrow, border, corrugation, and sprinkler.
- Land leveling is needed for uniform application of water with furrow, border, and corrugation methods.
- Use pipes, ditch linings, or drop structures in irrigation ditches to facilitate irrigation and reduce the risk of ditch erosion.
- Adjust applications of irrigation water to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.
- Because the soil is droughty, light and frequent irrigation is recommended.
- All crops but legumes respond to nitrogen. Legumes respond to phosphorus.
- Maintain tilth by returning crop residue to the soil, using legume mixtures, and using conservation tillage methods.
- Reduce the risk of soil blowing by planting field windbreaks and maintaining a plant cover.
- Maintain the quality and quantity of forage by rotating grazing, mowing and clipping, controlling weeds, and fertilizing.

Urban development

Major limitations: rapid permeability, hazard of soil blowing, unstable cutbanks, corrosivity

Suitable management practices and concerns:

- Effluent from septic tank absorption fields will not be filtered properly because of the rapid permeability of the soil.
- If the density of housing is moderate to high, a community sewage system will be needed to prevent pollution of the ground water.
- Cutbanks are not stable and are subject to slumping.

- Design shallow excavations with sloping banks or shoring and bracing to prevent cutbanks from caving in.

- Excavation for roads can expose material that is highly susceptible to wind erosion.

- This unit is a good source of roadfill.

- Preserve the existing plant cover during construction activities to reduce the risk of soil blowing.

- Offset the risk of corrosion to uncoated steel by using corrosion-resistant materials for foundations and underground utilities.

- Provide an adequate wearing surface on roads to reduce the amount of dust and lower maintenance costs.

- Install culverts to carry seasonal runoff where roads cross natural drainageways.

Windbreaks and Environmental Plantings

- Windbreaks are needed to limit soil losses, maintain optimum crop yields, protect farm and ranch buildings, and provide cover for wildlife.

- The trees and shrubs selected for planting should be suited to the conditions of the site.

- Irrigation should be provided for the establishment and maintenance of windbreaks.

Interpretive Groups

Land capability classification: Nonirrigated—7c, irrigated—4s

Range site: Sandy Upland 5-8" p.z.

285—Water-Riverwash complex

Setting

Landform: Channels and bars of the San Juan River

Shape of areas: Long and narrow

Size of areas: 50 to 350 acres

Elevation: 4,600 to 5,000 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Water: 70 percent

Riverwash: 20 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- The Bebeever and Walrees soils on small, braided flood plains

Characteristics of Water

Water is present in perennial channels of the river.

Characteristics of Riverwash

Riverwash consists of unstable sand, silt, and gravel that is reworked by water and wind so frequently that it supports little or no vegetation. It occurs on frequently flooded point and channel bars.

Major Uses

Wildlife habitat

Major limitations: presence of flowing water around Riverwash and small bodies of soil, frequent flooding

Suitable management practices and concerns:

- Open water plays an extremely important role in attracting wildlife of all kinds.
- Waterfowl, shore birds, and many song birds cannot do without open water. Mammals such as raccoons, beavers, and muskrats are also very dependent on open water.
- Several species of fish, including the endangered Colorado squawfish, inhabit the San Juan River.
- The river course is used as a major navigational aid by migrating birds.
- Birds utilize the Riverwash component for resting and feeding activities.
- Livestock grazing results in deterioration and removal of the minor amounts of vegetation, which impairs use of this unit for wildlife habitat.
- Protection from livestock grazing and needless development is essential.
- Competition between livestock and wildlife is high year-round.

Interpretive Groups

Land capability classification: **Water**—not assigned; **Riverwash**—nonirrigated—8

Range site: **Water**—not assigned; **Riverwash**—not assigned

290—Mesa clay loam, wet, 0 to 1 percent slopes

Setting

Landform: Treads of high stream terraces

Shape of areas: Irregular

Size of areas: 5 to 500 acres

Elevation: 4,900 to 5,100 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Mesa soil and similar soils: 85 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The gravelly Blackston soil on convex portions of treads
- Fruitland soils that have wet and moderately saline substrata
- The non-gravelly Mack soil in northwest Shiprock, and west of the Salt Creek Wash ditch
- Mesa soils which are slightly saline near drainage ditches
- The moderately sodic Kimbeto soil in small relict areas

Typical Profile

- 0 to 12 inches—brown clay loam
- 12 to 25 inches—brown clay loam
- 25 to 31 inches—light brown gravelly loam
- 31 to 37 inches—pinkish gray very gravelly sandy clay loam
- 37 to 68 inches—stratified light brown and brown very cobbly coarse sandy loam to very cobbly coarse sand

Soil Properties and Qualities

Parent material: Alluvium derived from sandstone, shale, quartzite, and granite

Depth class: Very deep

Drainage class: Moderately well drained

Permeability: Slow in upper part and rapid below

Available water capacity: Moderate to high

Water intake rate: Slow

Surface runoff: Very slow

Hazard of water erosion: Very slight

Hazard of soil blowing: Severe

Salinity: Very slightly saline

Sodicity: Slightly sodic

Corrosion potential: High for steel, moderate for concrete

Depth to seasonal high water table: 3.5 to 6.0 feet

Major Uses

Irrigated cropland and pasture

Urban development

Irrigated cropland and pasture

Suitable crops: alfalfa for hay, fruit, melons, corn, grasses and legumes for pasture

Major limitations: slow water intake rate, slow permeability, hazard of soil blowing, depth to water table

Suitable management practices and concerns:

- Suitable irrigation systems are furrow, border, corrugation, and sprinkler.
- The seasonal high water table provides supplemental moisture for plants.
- All crops but legumes respond to nitrogen. Legumes respond to phosphorus.
- Install and maintain deep drains to reduce wetness.
- Irrigate carefully to prevent a rise in the level of the water table, which increases the concentration of soluble salts and sodium in the soil.
- Increase the water intake rate by growing cover crops and regularly adding organic matter.
- A plowpan forms if the soil is excessively cultivated.
- Maintain tilth and reduce crusting of the surface by returning crop residue to the soil, using legume mixtures, and using conservation tillage methods.
- Reduce the risk of soil blowing by planting field windbreaks and maintaining a plant cover.
- Grazing when the soil is dry reduces compaction of the surface layer, maintains tilth, and prevents excessive runoff.
- Maintain the quality and quantity of forage by rotating grazing, mowing and clipping, controlling weeds, and fertilizing.

Urban development

Major limitations: depth to water table, rapid permeability in the substratum, unstable cutbanks, hazard of soil blowing, corrosivity

Suitable management practices and concerns:

- Shallow excavations will be hindered by the presence of ground water.
- Septic tank absorption fields may function poorly because of seasonal wetness.
- Effluent from septic tank absorption fields will not be filtered properly because of the rapid permeability in the substratum of the soil.
- Use mound-type septic systems to compensate for the soil restrictions.
- If the density of housing is moderate to high, a community sewage system will be needed to prevent pollution of the ground water.
- Cutbanks are not stable and are subject to slumping.
- Design shallow excavations with sloping banks or shoring and bracing to prevent cutbanks from caving in.
- Preserve the existing plant cover during construction activities to reduce the risk of soil blowing.
- Offset the risk of corrosion to uncoated steel and concrete by using corrosion-resistant materials for foundations and underground utilities.

- This unit is a good source of roadfill.
- Provide an adequate wearing surface on roads to reduce the amount of dust and lower maintenance costs.
- Install culverts to carry seasonal runoff where roads cross natural drainageways.

Windbreaks and Environmental Plantings

- Windbreaks are needed to limit soil losses, maintain optimum crop yields, protect farm and ranch buildings, and provide cover for wildlife.
- The trees and shrubs selected for planting should be suited to the conditions of the site.
- Irrigation should be provided for the establishment and maintenance of windbreaks.

Interpretive Groups

Land capability classification: Nonirrigated—7c, irrigated—2e

Range site: Loamy Upland 5-8" p.z.

295—Mesa sandy clay loam, wet, 0 to 1 percent slopes

Setting

Landform: Treads of high stream terraces

Shape of areas: Irregular

Size of areas: 5 to 500 acres

Elevation: 4,900 to 5,100 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Mesa soil and similar soils: 85 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The slowly permeable Mesa clay loam soil on lower areas
- The gravelly Blackston soil on convex portions of treads
- Fruitland soils that have wet and moderately saline substrata throughout the unit
- The non-gravelly Mack soils in northwest Shiprock and west of the Salt Creek Wash ditch
- Mesa soils which are slightly saline near drainage ditches
- The moderately sodic Kimbeto soils in small relict areas

Typical Profile

- 0 to 16 inches—brown sandy clay loam

- 16 to 29 inches—light brown sandy clay loam
- 29 to 35 inches—pink gravelly sandy clay loam
- 35 to 49 inches—pink very gravelly sandy clay loam
- 49 to 80 inches—stratified pale brown very cobbly coarse sandy loam to very cobbly coarse sand

Soil Properties and Qualities

Parent material: Alluvium derived from sandstone, shale, quartzite, and granite

Depth class: Very deep

Drainage class: Moderately well drained

Permeability: Moderate in upper part and rapid below

Available water capacity: Moderate to high

Water intake rate: Moderately slow

Surface runoff: Very slow

Hazard of water erosion: Very slight

Hazard of soil blowing: Severe

Salinity: Very slightly saline

Sodicity: Slightly sodic

Corrosion potential: High for steel, moderate for concrete

Depth to seasonal high water table: 3.5 to 6.0 feet

Major Uses

Irrigated cropland and pasture

Urban development

Irrigated cropland and pasture

Suitable crops: alfalfa for hay, fruit, melons, corn, grasses and legumes for pasture

Major limitations: hazard of soil blowing, depth to water table

Suitable management practices and concerns:

- Suitable irrigation systems are furrow, border, corrugation, and sprinkler.
- The seasonal high water table provides supplemental moisture for plants.
- All crops but legumes respond to nitrogen. Legumes respond to phosphorus.
- Install and maintain deep drains to reduce wetness.
- Irrigate carefully to prevent a rise in the level of the water table, which increases the concentration of soluble salts and sodium in the soil.
- A plowpan forms if the soil is excessively cultivated.
- Maintain tilth by returning crop residue to the soil, using legume mixtures, and using conservation tillage methods.
- Reduce the risk of soil blowing by planting field windbreaks and maintaining a plant cover.
- Grazing when the soil is dry reduces compaction of

the surface layer, maintains tilth, and prevents excessive runoff.

- Maintain the quality and quantity of forage by rotating grazing, mowing and clipping, controlling weeds, and fertilizing.

Urban development

Major limitations: depth to water table, rapid permeability in the substratum, unstable cutbanks, hazard of soil blowing, corrosivity

Suitable management practices and concerns:

- Shallow excavations will be hindered by the presence of ground water.
- Septic tank absorption fields may function poorly because of seasonal wetness.
- Effluent from septic tank absorption fields will not be filtered properly because of the rapid permeability in the substratum of the soil.
- Use mound-type septic systems to compensate for the soil restrictions.
- If the density of housing is moderate to high, a community sewage system will be needed to prevent pollution of the ground water.
- Cutbanks are not stable and are subject to slumping.
- Design shallow excavations with sloping banks or shoring and bracing to prevent cutbanks from caving in.
- Preserve the existing plant cover during construction activities to reduce the risk of soil blowing.
- Offset the risk of corrosion to uncoated steel and concrete by using corrosion-resistant materials for foundations and underground utilities.
- This unit is a good source of roadfill.
- Provide an adequate wearing surface on roads to reduce the amount of dust and lower maintenance costs.
- Install culverts to carry seasonal runoff where roads cross natural drainageways.

Windbreaks and Environmental Plantings

- Windbreaks are needed to limit soil losses, maintain optimum crop yields, protect farm and ranch buildings, and provide cover for wildlife.
- The trees and shrubs selected for planting should be suited to the conditions of the site.
- Irrigation should be provided for the establishment and maintenance of windbreaks.

Interpretive Groups

Land capability classification: Nonirrigated—7c, irrigated—2s

Range site: Loamy Upland 5-8" p.z.

300—Farview-Rock outcrop complex, 1 to 10 percent slopes

Setting

Landform: Mesas, structural benches, and cuestas

Position on the landform: **Farview**—summits and dipslopes; **Rock outcrop**—ledges, slickrock, and small cliffs

Shape of areas: Irregular

Size of areas: 100 to 2,000 acres

Elevation: 5,600 to 6,100 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F

Frost-free period: 130 to 150 days

Composition

Farview channery loamy sand and similar soils: 50 percent

Rock outcrop: 35 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The shallow, fine textured Eagleye soil on backslopes between structural benches and on scarp faces of cuestas
- The deep, moderately sodic Beclabito soil on small toeslopes
- The very deep, coarse textured Mido soil on stable dunes of Palmer Mesa
- The very deep Kitsili soil on fan terraces in narrow canyons

Characteristics of the Farview Soil

Typical profile:

- 0 to 2 inches—yellowish brown channery loamy sand
- 2 to 9 inches—light yellowish brown channery fine sandy loam
- 9 inches—sandstone bedrock

Parent material: Alluvium and eolian material derived from sandstone

Depth class: Very shallow

Drainage class: Well drained

Permeability: Moderately rapid

Available water capacity: Very low

Surface runoff: Rapid

Hazard of water erosion: Severe

Hazard of soil blowing: Severe

Characteristics of Rock outcrop

Rock outcrop consists of exposures of sandstone

bedrock. It occurs as horizontal ledges, gently to moderately sloping slickrock, and as small vertical cliffs. There is little or no vegetation, and surface runoff is rapid to very rapid.

Major Uses

Livestock grazing

Woodland production

Livestock grazing

Dominant understory vegetation in potential plant community:

New Mexico feathergrass, Bigelow sagebrush, Indian ricegrass, galleta, blue grama, thrifty goldenweed, Stansbury cliffrose, true mountainmahogany, broom snakeweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—500

Unfavorable years—300

Present understory plant community:

Indian ricegrass, cheatgrass, Bigelow sagebrush, broom snakeweed, green Mormon tea, thrifty goldenweed

Major limitations: hazard of water erosion, hazard of soil blowing, depth to bedrock, presence of rock outcrops

Suitable management practices and concerns:

- The density of the canopy is generally less than 25 percent and produces understory plants suitable for grazing.
- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Vary the season of grazing and the periods of rest during successive years.
- Suitability for mechanical range seeding is poor because of soil factors and tree density.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of water erosion and soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Woodland production

Dominant overstory vegetation:

Utah juniper (60%), pinyon (40%)

Average site index: 20

Major limitations: hazard of water erosion, hazard of soil blowing, equipment limitations, seedling mortality, windthrow hazard, low productivity

Suitable management practices and concerns:

- The potential is poor for harvesting wood products such as fuelwood, fence posts, Christmas trees, and ornamental trees.
- Maintaining the understory vegetation is essential in controlling erosion.
- The use of wheeled equipment in harvesting the limited wood products on this soil is severely restricted in most places because of the presence of numerous rock outcrops.
- Tree seedlings have a low rate of survival because of high summer temperatures and the very low water holding capacity of the soil.
- Reduce the problem of seedling mortality by leaving the larger trees to provide shade for seedling trees.
- Because roots are restricted by bedrock, trees have a severe hazard of windthrow when the soil is excessively wet and winds are strong.
- To reduce the hazard of windthrow, avoid cutting trees, limit the width of maintained roads, and avoid making new openings in the canopy.

Interpretive Groups

Land capability classification: **Farview**—nonirrigated—7s; **Rock outcrop**—nonirrigated—8s

Range site: **Farview**—not assigned (pj woodland); **Rock outcrop**—not assigned

301—Farview-Sanostee-Rock outcrop association, 1 to 10 percent slopes

Setting

Landform: Mesas, structural benches, and cuestas

Position on the landform: **Farview**—summits and dipslopes; **Sanostee**—toeslopes and dipslopes;

Rock outcrop—slickrock and small ledges

Slope: **Farview**—1 to 10 percent; **Sanostee**—1 to 10 percent

Shape of areas: Elongate

Size of areas: 20 to 2,000 acres

Elevation: 5,900 to 6,800 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F

Frost-free period: 130 to 150 days

Composition

Farview channery loamy sand and similar soils: 45 percent

Sanostee loamy fine sand and similar soils: 30 percent

Rock outcrop: 15 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- The deep phase of the moderately fine textured Doakum soil on summits of mesas
- The very deep, coarse textured Mido soil on stable dunes
- Badland on barren shale slopes in small canyons

Characteristics of the Farview Soil*Typical profile:*

- 0 to 2 inches—light brown channery loamy sand
- 2 to 6 inches—light brown channery sandy loam
- 6 inches—sandstone bedrock

Parent material: Alluvium and eolian material derived from sandstone

Depth class: Very shallow

Drainage class: Well drained

Permeability: Moderately rapid

Available water capacity: Very low

Surface runoff: Rapid

Hazard of water erosion: Slight

Hazard of soil blowing: Severe

Characteristics of the Sanostee Soil*Typical profile:*

- 0 to 2 inches—light brown loamy fine sand
- 2 to 15 inches—brown and light brown sandy clay loam
- 15 to 24 inches—white loam
- 24 to 32 inches—light gray and very pale brown loam and sandy loam
- 32 inches—sandstone bedrock

Parent material: Eolian material, alluvium, and residuum derived from sandstone and siltstone

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Very low to low

Surface runoff: Slow

Hazard of water erosion: Moderate

Hazard of soil blowing: Very severe

Salinity: Slightly saline below a depth of 15 inches

Sodicity: Slightly sodic below a depth of 15 inches

Characteristics of Rock outcrop

Rock outcrop consists of exposures of sandstone bedrock. It occurs as horizontal ledges and as gently to moderately sloping slickrock. There is little or no vegetation, and surface runoff is rapid.

Major Uses

Livestock grazing
Woodland production

Livestock grazing**Farview soil**

Dominant understory vegetation in potential plant community:

New Mexico feathergrass, Bigelow sagebrush, Indian ricegrass, galleta, blue grama, thrifty goldenweed, Stansbury cliffrose, true mountainmahogany, broom snakeweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—500

Unfavorable years—300

Present understory plant community:

blue grama, Indian ricegrass, Fendler threeawn, galleta, Bigelow sagebrush, true mountainmahogany, broom snakeweed

Sanostee soil

Dominant vegetation in potential plant community:

Indian ricegrass, blue grama, galleta, bottlebrush squirreltail, Bigelow sagebrush, fourwing saltbush, southwest rabbitbrush, Wyoming big sagebrush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—900

Unfavorable years—400

Present plant community:

blue grama, galleta, sand dropseed, broom snakeweed, Bigelow sagebrush, southwest rabbitbrush

Major limitations:

Farview—hazard of water erosion, hazard of soil blowing, depth to bedrock

Sanostee—hazard of soil blowing, depth to bedrock
Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.

- Vary the season of grazing and the periods of rest during successive years.

- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.

- Control the time and amount of use by livestock.

- Reduce the risk of water erosion and soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Sanostee soil

- Range seeding may be needed if the better forage plants have decreased.

- Suitability for range seeding is fair because of climate factors.

- If shrubs are managed to create open areas, a good stand of desirable grasses and forbs can be produced.

- Manage the brush in areas where unpalatable brushy plants have increased significantly. Control the brush by mechanical means or prescribed burning.

- Seed the range if the plant cover is not sufficient to protect the soil from erosion.

- Seed late in the fall for best results.

- After seeding, defer grazing until the young plants are well established.

Farview soil

- The density of the canopy is generally less than 25 percent and produces understory plants suitable for grazing.

- Suitability for mechanical range seeding is poor because of soil factors and tree density.

Woodland production**Farview soil**

Dominant overstory vegetation:

Utah juniper (60%), pinyon (40%)

Average site index: 20

Major limitations: hazard of water erosion, hazard of soil blowing, equipment limitations, seedling mortality, windthrow hazard, low productivity

Suitable management practices and concerns:

- The potential is poor for harvesting wood products such as fuelwood, fence posts, Christmas trees, and ornamental trees.

- Maintaining the understory vegetation is essential in controlling erosion.

- The use of wheeled equipment in harvesting the limited wood products on this soil is moderately restricted in most places because of the presence of numerous rock outcrops.

- Tree seedlings have a low rate of survival because of high summer temperatures and the very low water holding capacity of the soil.

- Reduce the problem of seedling mortality by leaving the larger trees to provide shade for seedling trees.

- Because roots are restricted by bedrock, trees have a severe hazard of windthrow when the soil is excessively wet and winds are strong.

- To reduce the hazard of windthrow, avoid cutting trees, limit the width of maintained roads, and avoid making new openings in the canopy.

Interpretive Groups

Land capability classification: **Farview**—nonirrigated—7s; **Sanostee**—nonirrigated—6c;
Rock outcrop—nonirrigated—8s
Range site: **Farview**—not assigned (pj woodland);
Sanostee—Sandy Loam Upland 10-14" p.z.;
Rock outcrop—not assigned

302—Doakum fine sandy loam, 1 to 10 percent slopes

Setting

Landform: Summits of mesas and on toeslopes
Shape of areas: Irregular
Size of areas: 20 to 2,000 acres
Elevation: 6,300 to 7,000 feet
Mean annual precipitation: 8 to 12 inches
Mean annual air temperature: 50 to 52 degrees F
Frost-free period: 130 to 150 days

Composition

Doakum soil and similar soils: 90 percent
 Contrasting inclusions: 10 percent

Contrasting Inclusions

- The moderately deep Sanostee soil on toeslopes
- The very shallow Farview soil on structural benches
- Rock outcrop of sandstone bedrock along small drainages

Typical Profile

- 0 to 2 inches—brown fine sandy loam
- 2 to 16 inches—brown sandy clay loam
- 16 to 53 inches—light reddish brown sandy clay loam and loam
- 53 inches—sandstone bedrock

Soil Properties and Qualities

Parent material: Eolian material and alluvium derived from sandstone
Depth class: Deep
Drainage class: Well drained
Permeability: Moderate
Available water capacity: Moderate
Surface runoff: Medium
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe
Salinity: Slightly saline between 16 and 53 inches
Sodicity: Slightly sodic between 16 and 53 inches

Major Uses

Livestock grazing

Dominant vegetation in potential plant community:
 western wheatgrass, Indian ricegrass, blue grama, galleta, Wyoming big sagebrush, bottlebrush squirreltail, fourwing saltbush
Annual production of air-dry vegetation (pounds per acre):

Favorable years—1,000

Unfavorable years—600

Present plant community:

blue grama, galleta, sand dropseed, broom snakeweed, Wyoming big sagebrush

Major limitations: hazard of soil blowing, hazard of water erosion

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Provide periodic rest during spring in alternate years.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.
- Range seeding may be needed if the better forage plants have decreased.
- Suitability for range seeding is fair because of climate factors.
- If shrubs are managed to create open areas, a good stand of desirable grasses and forbs can be produced.
- Manage the brush in areas where unpalatable brushy plants have increased significantly. Control the brush by mechanical means or prescribed burning.
- Seed the range if the plant cover is not sufficient to protect the soil from erosion.
- Seed late in the fall for best results.
- After seeding, defer grazing until the young plants are well established.

Interpretive Groups

Land capability classification: Nonirrigated—6c
Range site: Loamy Upland 10-14" p.z.

303—Snapill very fine sandy loam, 1 to 6 percent slopes

Setting

Landform: Summits of mesas and plateaus

Shape of areas: Irregular

Size of areas: 20 to 2,000 acres

Elevation: 5,600 to 6,100 feet

Mean annual precipitation: 8 to 10 inches

Mean annual air temperature: 50 to 52 degrees F

Frost-free period: 130 to 150 days

Composition

Snapill soil and similar soils: 85 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The moderately saline-sodic Beclabito soil on toeslopes
- The very deep, coarse textured Mido soil on stable dunes
- The very shallow Farview soil on small structural benches

Typical Profile

- 0 to 3 inches—brown very fine sandy loam
- 3 to 13 inches—brown loam
- 13 to 38 inches—light brown loam
- 38 to 53 inches—white loam
- 53 inches—shale bedrock

Soil Properties and Qualities

Parent material: Eolian material and alluvium derived from siltstone and sandstone

Depth class: Deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Moderate to high

Surface runoff: Medium

Hazard of water erosion: Severe

Hazard of soil blowing: Moderate

Salinity: Slightly saline below a depth of 38 inches

Sodicity: Moderately sodic below a depth of 22 inches

Major Uses

Livestock grazing

Dominant vegetation in potential plant community: western wheatgrass, Indian ricegrass, galleta, bottlebrush squirreltail, fourwing saltbush, Wyoming big sagebrush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—1,000

Unfavorable years—600

Present plant community:

galleta, cheatgrass, broom snakeweed, fourwing saltbush, datil yucca

Major limitations: hazard of water erosion, hazard of soil blowing

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Provide periodic rest during spring in alternate years.
- Reduce the risk of water erosion and soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.
- Range seeding may be needed if the better forage plants have decreased.
- Suitability for range seeding is fair because of climate factors.
- If shrubs are managed to create open areas, a good stand of desirable grasses and forbs can be produced.
- Manage the brush in areas where unpalatable brushy plants have increased significantly. Control the brush by mechanical means or prescribed burning.
- Seed the range if the plant cover is not sufficient to protect the soil from erosion.
- Seed late in the fall for best results.
- After seeding, defer grazing until the young plants are well established.

Interpretive Groups

Land capability classification: Nonirrigated—6c

Range site: Loamy Upland 10-14" p.z.

304—Farview-Beclabito-Rock outcrop complex, 1 to 10 percent slopes

Setting

Landform: Cuestas, mesas, and structural benches

Position on the landform: **Farview**—dipslopes and summits; **Beclabito**—toeslopes between cuestas; **Rock outcrop**—slickrock and small vertical cliffs

Slope: **Farview**—1 to 10 percent; **Beclabito**—1 to 5 percent

Shape of areas: Irregular

Size of areas: 20 to 5,000 acres

Elevation: 4,900 to 6,100 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F

Frost-free period: 130 to 150 days

Composition

Farview channery loamy sand and similar soils: 60 percent

Beclabito fine sandy loam and similar soils: 20 percent

Rock outcrop: 10 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- The shallow, fine textured Eagleye soil on short backslopes
- The fine textured, moderately sodic McElmo soil on toeslopes
- Moderately deep soils that have very flaggy or stony surfaces on small cuestas
- The very deep, moderately coarse textured Strych soil on steep backslopes above shallow canyons

Characteristics of the Farview Soil

Typical profile:

- 0 to 2 inches—light brown channery loamy sand
- 2 to 6 inches—light brown channery sandy loam
- 6 inches—sandstone bedrock

Parent material: Alluvium and eolian material derived from sandstone

Depth class: Very shallow

Drainage class: Well drained

Permeability: Moderately rapid

Available water capacity: Very low

Surface runoff: Rapid

Hazard of water erosion: Slight

Hazard of soil blowing: Severe

Characteristics of the Beclabito Soil

Typical profile:

- 0 to 4 inches—brown fine sandy loam
- 4 to 14 inches—strong brown fine sandy loam
- 14 to 36 inches—light brown, pinkish white, and strong brown sandy clay loam
- 36 to 45 inches—very pale brown sandy clay loam

- 45 to 56 inches—light gray clay loam

- 56 inches—sandstone bedrock

Parent material: Alluvium and residuum derived from sandstone and shale

Depth class: Deep

Drainage class: Well drained

Permeability: Moderately slow

Available water capacity: Low to moderate

Surface runoff: Medium

Hazard of water erosion: Moderate

Hazard of soil blowing: Severe

Salinity: Moderately saline below a depth of 36 inches

Sodicity: Moderately sodic below a depth of 14 inches

Characteristics of Rock outcrop

Rock outcrop consists of exposures of sandstone bedrock. It occurs as gently to moderately sloping slickrock, and as small vertical cliffs. There is little or no vegetation, and surface runoff is rapid to very rapid.

Major Uses

Livestock grazing

Woodland production

Livestock grazing

Farview soil

Dominant understory vegetation in potential plant community:

New Mexico feathergrass, Bigelow sagebrush, Indian ricegrass, galleta, blue grama, thrifty goldenweed, Stansbury cliffrose, true mountainmahogany, broom snakeweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—500

Unfavorable years—300

Present understory plant community:

New Mexico feathergrass, Indian ricegrass, cheatgrass, broom snakeweed, Bigelow sagebrush, singleleaf ash

Beclabito soil

Dominant vegetation in potential plant community:

Indian ricegrass, galleta, shadscale, alkali sacaton, bottlebrush squirreltail, broom snakeweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—600

Unfavorable years—400

Present plant community:

galleta, cheatgrass, Indian ricegrass, alkali sacaton, broom snakeweed, shadscale

Major limitations:

Farview—hazard of water erosion, hazard of soil

blowing, depth to bedrock, presence of rock outcrops

Beclabito—hazard of soil blowing, hazard of water erosion, sodicity

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Beclabito soil

- Suitability for range seeding is poor because of soil factors.

Farview soil

- The density of the canopy is generally less than 25 percent and produces understory plants suitable for grazing.
- Suitability for mechanical range seeding is poor because of soil factors and tree density.

Woodland production

Farview soil

Dominant overstory vegetation:

Utah juniper (90%), pinyon (10%)

Average site index: 20

Major limitations: hazard of water erosion, hazard of soil blowing, equipment limitations, seedling mortality, windthrow hazard, low productivity

Suitable management practices and concerns:

- The potential is poor for harvesting wood products such as fuelwood, fence posts, Christmas trees, and ornamental trees.
- Maintaining the understory vegetation is essential in controlling erosion.
- The use of wheeled equipment in harvesting the limited wood products on this soil is moderately restricted in most places because of the presence of numerous rock outcrops.
- Tree seedlings have a low rate of survival because of high summer temperatures and the very low water holding capacity of the soil.
- Reduce the problem of seedling mortality by leaving some of the larger trees to provide shade for seedling trees.

- Because roots are restricted by bedrock, trees have a severe hazard of windthrow when the soil is excessively wet and winds are strong.

- To reduce the hazard of windthrow, avoid cutting trees, limit the width of maintained roads, and avoid making new openings in the canopy.

Interpretive Groups

Land capability classification: **Farview**—

nonirrigated—7s; **Beclabito**—nonirrigated—6c;

Rock outcrop—nonirrigated—8s

Range site: **Farview**—not assigned (pj woodland);

Beclabito—Sandy Loam Upland (saline) 10-14" p.z.; **Rock outcrop**—not assigned

305—Strych-Eagleeye-Rock outcrop complex, 15 to 70 percent slopes

Setting

Landform: Escarpments of mesas

Position on the landform: **Strych**—backslopes of stable landslides; **Eagleeye**—footslopes and backslopes; **Rock outcrop**—cliffs and ledges

Slope: **Strych**—15 to 70 percent; **Eagleeye**—15 to 60 percent

Shape of areas: Elongated with complex slopes

Size of areas: 100 to 2,000 acres

Elevation: 5,700 to 7,000 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F

Frost-free period: 130 to 150 days

Composition

Strych extremely flaggy very fine sandy loam, rubbly and similar soils: 50 percent

Eagleeye very channery clay loam, very bouldery and similar soils: 25 percent

Rock outcrop: 15 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- Badland on barren shale slopes
- The moderately fine textured Snapill soil on small summits above Palmer Mesa
- Espiritu soils on high, north-facing landslides
- The very shallow Farview soil on small structural benches above Palmer Mesa
- Shallow soils which are strongly sodic on backslopes
- The very deep, coarse textured Mido soil and the moderately deep, fine textured Bodot soil on areas below Toh Atin Mesa in Arizona

Characteristics of the Strych Soil

Typical profile:

- 0 to 3 inches—pale brown extremely flaggy very fine sandy loam
- 3 to 15 inches—very pale brown very flaggy very fine sandy loam
- 15 to 47 inches—very pale brown and light yellowish brown very stony very fine sandy loam
- 47 to 64 inches—light yellowish brown very stony very fine sandy loam

Parent material: Colluvium derived from sandstone

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately rapid

Available water capacity: Low to moderate

Surface runoff: Medium

Hazard of water erosion: Very severe

Hazard of soil blowing: Very slight

Sodicity: Slightly sodic below a depth of 15 inches

Characteristics of the Eagleye Soil

Typical profile:

- 0 to 2 inches—pale brown very channery clay loam
- 2 to 8 inches—light yellowish brown and gray silty clay loam
- 8 to 18 inches—light brownish gray and gray silty clay loam
- 18 inches—shale bedrock

Parent material: Alluvium and residuum derived from shale and sandstone

Depth class: Shallow

Drainage class: Well drained

Permeability: Slow

Available water capacity: Very low

Surface runoff: Rapid

Hazard of water erosion: Very severe

Hazard of soil blowing: Moderate

Salinity: Moderately saline below a depth of 8 inches

Sodicity: Slightly sodic below a depth of 8 inches

Shrink-swell potential: High

Characteristics of Rock outcrop

Rock outcrop consists of exposures of sandstone bedrock. It occurs as cliffs and ledges above the Strych soil and intermixed with the Eagleye soil. There is little or no vegetation, and surface runoff is rapid to very rapid.

Major Uses

Livestock grazing

Strych soil

Dominant vegetation in potential plant community:

New Mexico feathergrass, needleandthread, Indian ricegrass, muttongrass, Utah juniper, Bigelow sagebrush, desert needlegrass, galleta, black grama, Wyoming big sagebrush, green Mormon tea

Annual production of air-dry vegetation (pounds per acre):

Favorable years—850

Unfavorable years—450

Present plant community:

New Mexico feathergrass, Indian ricegrass, galleta, alkali sacaton, cheatgrass, Bigelow sagebrush, shadscale, broom snakeweed, Utah juniper

Eagleye soil

Dominant vegetation in potential plant community:

shadscale, galleta, alkali sacaton, Indian ricegrass, bottlebrush squirreltail, Bigelow sagebrush, Greene rabbitbrush, broom snakeweed, slenderleaf buckwheat, Utah juniper

Annual production of air-dry vegetation (pounds per acre):

Favorable years—650

Unfavorable years—250

Present plant community:

alkali sacaton, galleta, cheatgrass, Indian ricegrass, shadscale, Bigelow sagebrush, broom snakeweed

Major limitations:

Strych—hazard of water erosion, steep slopes, surface rock fragments

Eagleye—hazard of water erosion, hazard of soil blowing, depth to bedrock, steep slopes, surface rock fragments, shrink-swell potential, presence of rock outcrops

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of soil factors.
- Uniform distribution of grazing is difficult because of the slope or the lack of permanent water developments, or both.
- Livestock prefer to graze the easily accessible areas before they graze the steep slopes.
- Control the time and amount of use by livestock.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Provide periodic rest during spring in alternate years.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate

plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Strych**—nonirrigated—7s; **Eagleeye**—nonirrigated—7e; **Rock outcrop**—nonirrigated—8s

Range site: **Strych**—Breaks 10-14" p.z.; **Eagleeye**—Clayey Slopes 10-14" p.z.; **Rock outcrop**—not assigned

306—Arches-Kitsili-Mido complex, 1 to 25 percent slopes

Setting

Landform: Dissected plateaus

Position on the landform: **Arches**—structural benches; **Kitsili**—fan terraces; **Mido**—stable dunes

Slope: **Arches**—4 to 25 percent; **Kitsili**—1 to 6 percent; **Mido**—4 to 10 percent

Shape of areas: Irregular

Size of areas: 50 to 5,000 acres

Elevation: 5,600 to 6,500 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F

Frost-free period: 130 to 150 days

Composition

Arches loamy fine sand and similar soils: 45 percent
Kitsili fine sandy loam and similar soils: 25 percent
Mido loamy fine sand and similar soils: 20 percent
Contrasting inclusions: 10 percent

Contrasting Inclusions

- Rock outcrop as exposures of sandstone bedrock on cliffs and slickrock
- The moderately fine textured Doakum soil on fan terraces
- Riverwash in washes
- Saline-sodic soils shallow to shale

Characteristics of the Arches Soil

Typical profile:

- 0 to 3 inches—yellowish red loamy fine sand
- 3 to 14 inches—yellowish red and red loamy fine sand
- 14 to 18 inches—light reddish brown sand
- 18 inches—sandstone bedrock

Parent material: Eolian material and residuum derived from sandstone

Depth class: Shallow

Drainage class: Well drained

Permeability: Rapid

Available water capacity: Very low

Surface runoff: Medium

Hazard of water erosion: Very severe

Hazard of soil blowing: Very severe

Characteristics of the Kitsili Soil

Typical profile:

- 0 to 7 inches—reddish brown fine sandy loam
- 7 to 14 inches—reddish brown fine sandy loam
- 14 to 64 inches—reddish brown fine sandy loam and very fine sandy loam

Parent material: Alluvium and eolian material derived from sandstone

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately rapid

Available water capacity: High

Surface runoff: Medium

Hazard of water erosion: Moderate

Hazard of soil blowing: Moderate

Characteristics of the Mido Soil

Typical profile:

- 0 to 3 inches—yellowish red loamy fine sand
- 3 to 62 inches—yellowish red loamy fine sand

Parent material: Eolian material derived from sandstone

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Rapid

Available water capacity: Low to moderate

Surface runoff: Slow

Hazard of water erosion: Moderate

Hazard of soil blowing: Very severe

Major Uses

Livestock grazing

Arches soil

Dominant vegetation in potential plant community:

Indian ricegrass, New Mexico feathergrass, Bigelow sagebrush, galleta, blue grama, antelope bitterbrush, Stansbury cliffrose, green Mormon tea, Utah juniper

Annual production of air-dry vegetation (pounds per acre):

Favorable years—500

Unfavorable years—300

Present plant community:

Indian ricegrass, blue grama, galleta, broom snakeweed, Bigelow sagebrush

Kitsili soil

Dominant vegetation in potential plant community:

Indian ricegrass, needleandthread, blue grama,

galleta, sand dropseed, Cutler Mormon tea, broom snakeweed, Greene rabbitbrush, Wyoming big sagebrush,

Annual production of air-dry vegetation (pounds per acre):

Favorable years—900

Unfavorable years—400

Present plant community:

Indian ricegrass, blue grama, Fendler threeawn, galleta, broom snakeweed, Greene rabbitbrush, fourwing saltbush

Mido soil

Dominant vegetation in potential plant community:

needleandthread, Indian ricegrass, blue grama, sand dropseed, sandhill muhly, Cutler Mormon tea, fourwing saltbush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—900

Unfavorable years—400

Present plant community:

needleandthread, Indian ricegrass, blue grama, Fendler threeawn, sandhill muhly, broom snakeweed, Bigelow rubber rabbitbrush

Major limitations:

Arches—hazard of soil blowing, hazard of water erosion, depth to bedrock

Kitsili—hazard of soil blowing, hazard of water erosion

Mido—hazard of soil blowing

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Arches and Mido soils

- Suitability for range seeding is poor because of soil factors.

Kitsili soil

- Range seeding may be needed if the better forage plants have decreased.
- Suitability for range seeding is fair because of climate factors.
- If shrubs are managed to create open areas, a

good stand of desirable grasses and forbs can be produced.

- Manage the brush in areas where unpalatable brushy plants have increased significantly. Control the brush by mechanical means or prescribed burning.
- Seed the range if the plant cover is not sufficient to protect the soil from erosion.
- Seed late in the fall for best results.
- After seeding, defer grazing until the young plants are well established.

Interpretive Groups

Land capability classification: **Arches**—

nonirrigated—7s; **Kitsili**—nonirrigated—6c;

Mido—nonirrigated—7e

Range site: **Arches**—Shallow Sandy 10-14" p.z.;

Kitsili—Sandy Loam Upland 10-14" p.z.; **Mido**—Sandy Upland 10-14" p.z.

307—Bodot-Beclabito-Rock outcrop complex, 15 to 65 percent slopes

Setting

Landform: Escarpments of mesas and cuevas

Position on the landform: **Bodot**—backslopes;

Beclabito—alluvial cones and footslopes; **Rock outcrop**—cliffs

Slope: **Bodot**—35 to 65 percent; **Beclabito**—15 to 45 percent

Shape of areas: Elongate

Size of areas: 100 to 1,000 acres

Elevation: 5,000 to 6,600 feet

Mean annual precipitation: 8 to 10 inches

Mean annual air temperature: 50 to 52 degrees F

Frost-free period: 130 to 150 days

Composition

Bodot extremely gravelly clay loam, rubbly and similar soils: 40 percent

Beclabito very cobbly very fine sandy loam, extremely stony and similar soils: 35 percent

Rock outcrop: 15 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- The shallow Arches soil on small structural benches
- Riverwash in narrow washes of canyon bottoms
- The coarse textured Mido soil on stable dunes above valley floors

- The fine textured McElmo soil on slopes of less than 15 percent

Characteristics of the Bodot Soil

Typical profile:

- 0 to 3 inches—light reddish brown extremely gravelly clay loam
- 3 to 8 inches—light reddish brown silty clay
- 8 to 24 inches—pinkish gray and pink silty clay loam
- 24 inches—shale bedrock

Parent material: Colluvium and residuum derived from shale and sandstone

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Slow

Available water capacity: Low

Surface runoff: Rapid

Hazard of water erosion: Severe

Hazard of soil blowing: Very slight

Salinity: Slightly saline below a depth of 8 inches

Sodicity: Slightly sodic

Shrink-swell potential: High

Characteristics of the Beclabito Soil

Typical profile:

- 0 to 4 inches—reddish brown very cobbly very fine sandy loam
- 4 to 23 inches—reddish brown and light reddish brown gravelly clay loam and gravelly sandy clay loam
- 23 to 32 inches—white and pale red clay loam
- 32 to 56 inches—weak red and light greenish gray clay
- 56 inches—shale and soft sandstone bedrock

Parent material: Alluvium and residuum derived from shale and sandstone

Depth class: Deep

Drainage class: Well drained

Permeability: Moderately slow

Available water capacity: High

Surface runoff: Rapid

Hazard of water erosion: Very severe

Hazard of soil blowing: Moderate

Sodicity: Moderately sodic below a depth of 17 inches

Characteristics of Rock outcrop

Rock outcrop consists of exposures of sandstone bedrock. It occurs as steeply sloping to vertical cliffs and ledges between the soil components. There is little or no vegetation, and surface runoff is very rapid.

Major Uses

Livestock grazing

Bodot soil

Dominant vegetation in potential plant community: salina wildrye, galleta, Indian ricegrass, Bigelow sagebrush, shadscale, black sagebrush, broom snakeweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—550

Unfavorable years—350

Present plant community:

galleta, salina wildrye, Indian ricegrass, Bigelow sagebrush, broom snakeweed, shadscale

Beclabito soil

Dominant vegetation in potential plant community: galleta, alkali sacaton, shadscale, Indian ricegrass, New Mexico feathergrass, broom snakeweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—550

Unfavorable years—350

Present plant community:

galleta, alkali sacaton, Indian ricegrass, shadscale, broom snakeweed

Major limitations:

Bodot—hazard of water erosion, steep slopes, surface rock fragments, shrink-swell potential, presence of rock outcrops

Beclabito—hazard of water erosion, hazard of soil blowing, steep slopes, surface rock fragments

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of soil factors.
- Uniform distribution of grazing is difficult because of the slope or the lack of permanent water developments, or both.
- Livestock prefer to graze the easily accessible areas before they graze the steep slopes.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of water erosion and soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Bodot**—nonirrigated—7e; **Beclabito**—nonirrigated—7e; **Rock outcrop**—nonirrigated—8s
Range site: **Bodot**—Clayey Slopes (bouldery) 10-14" p.z.; **Beclabito**—Stony Slopes 10-14" p.z.; **Rock outcrop**—not assigned

308—McElmo-Farview complex, 2 to 15 percent slopes

Setting

Landform: Cuestas
Position on the landform: **McElmo**—dipslopes; **Farview**—dipslopes
Slope: **McElmo**—5 to 15 percent; **Farview**—2 to 10 percent
Shape of areas: Irregular
Size of areas: 20 to 2,000 acres
Elevation: 5,300 to 6,300 feet
Mean annual precipitation: 8 to 12 inches
Mean annual air temperature: 50 to 52 degrees F
Frost-free period: 130 to 150 days

Composition

McElmo very gravelly sandy clay loam and similar soils: 60 percent
 Farview fine sandy loam and similar soils: 25 percent
 Contrasting inclusions: 15 percent

Contrasting Inclusions

- The moderately deep Bodot soil on 15 to 50 percent slopes
- Rock outcrop as exposures of sandstone bedrock occurring on small cliffs and ledges
- The moderately fine textured Beclabito soil between Salt Wash and Mitten Rock

Characteristics of the McElmo Soil

Typical profile:

- 0 to 1 inch—light reddish brown very gravelly sandy clay loam
- 1 to 14 inches—yellowish red and light reddish brown gravelly clay and clay
- 14 to 30 inches—pink cobbly silty clay loam
- 30 to 54 inches—pink gypsiferous material which is an apparent silty clay loam
- 54 inches—shale bedrock

Parent material: Alluvium and residuum derived from shale and sandstone
Depth class: Deep
Drainage class: Well drained

Permeability: Slow

Available water capacity: Low to moderate

Surface runoff: Rapid

Hazard of water erosion: Moderate

Hazard of soil blowing: Moderate

Salinity: Moderately saline below a depth of 14 inches

Sodicity: Moderately sodic below a depth of 1 inch

Shrink-swell potential: High

Characteristics of the Farview Soil

Typical profile:

- 0 to 3 inches—light brown fine sandy loam
- 3 to 7 inches—very pale brown fine sandy loam
- 7 inches—sandstone bedrock

Parent material: Alluvium and eolian material derived from sandstone

Depth class: Very shallow

Drainage class: Well drained

Permeability: Moderately rapid

Available water capacity: Very low

Surface runoff: Medium

Hazard of water erosion: Moderate

Hazard of soil blowing: Severe

Major Uses

Livestock grazing
 Woodland production

Livestock grazing

McElmo soil

Dominant vegetation in potential plant community: galleta, alkali sacaton, shadscale, mound saltbush, sand dropseed, desert seepweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—350

Unfavorable years—150

Present plant community:

galleta, sand dropseed, alkali sacaton, shadscale, mound saltbush, broom snakeweed

Farview soil

Dominant understory vegetation in potential plant community:

New Mexico feathergrass, Bigelow sagebrush, Indian ricegrass, galleta, blue grama, thrifty goldenweed, Stansbury cliffrose, true mountainmahogany, broom snakeweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—500

Unfavorable years—300

Present understory plant community:

New Mexico feathergrass, Indian ricegrass, Bigelow sagebrush, broom snakeweed, green Mormon tea

Major limitations:

McElmo—hazard of water erosion, hazard of soil blowing, sodicity, shrink-swell potential

Farview—hazard of soil blowing, hazard of water erosion, depth to bedrock

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Vary the season of grazing and the periods of rest during successive years.
- Uniform distribution of grazing is difficult because of the slope or the lack of permanent water developments, or both.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Provide periodic rest during spring in alternate years.
- Reduce the risk of water erosion and soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

McElmo soil

- Suitability for range seeding is poor because of soil factors.

Farview soil

- The density of the canopy is generally less than 25 percent and produces understory plants suitable for grazing.
- Suitability for mechanical range seeding is poor because of soil factors and tree density.

Woodland production**Farview soil**

Dominant overstory vegetation: Utah juniper (90%), pinyon (10%)

Average site index: 20

Major limitations: hazard of water erosion, hazard of soil blowing, equipment limitations, seedling mortality, windthrow hazard, low productivity

Suitable management practices and concerns:

- The potential is poor for harvesting wood products such as fuelwood, fence posts, Christmas trees, and ornamental trees.
- Maintaining the understory vegetation is essential in controlling erosion.
- The use of wheeled equipment in harvesting the limited wood products on this soil is moderately restricted in most places because of the presence of rock outcrops.
- Tree seedlings have a low rate of survival because

of high summer temperatures and the very low water holding capacity of the soil.

- Reduce the problem of seedling mortality by leaving the larger trees to provide shade for seedling trees.
- Because roots are restricted by bedrock, trees have a severe hazard of windthrow when the soil is excessively wet and winds are strong.
- To reduce the hazard of windthrow, avoid cutting trees, limit the width of maintained roads, and avoid making new openings in the canopy.

Interpretive Groups

Land capability classification: **McElmo**—

nonirrigated—6c; **Farview**—nonirrigated—7s

Range site: **McElmo**—Clayey Upland (sodic) 10-14" p.z.; **Farview**—not assigned (pj woodland)

309—Rock outcrop-Rizno complex, 2 to 20 percent slopes**Setting**

Landform: Cuestas and structural benches

Position on the landform: **Rock outcrop**—cliffs and slickrock; **Rizno**—dipslopes and summits

Shape of areas: Irregular

Size of areas: 100 to 3,000 acres

Elevation: 5,500 to 6,500 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F

Frost-free period: 130 to 150 days

Composition

Rock outcrop: 50 percent

Rizno fine sandy loam and similar soils: 35 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The very deep, moderately coarse textured Kitsili soil on fan terraces
- The very deep, coarse textured Mido soil on stable dunes
- Riverwash in washes
- The shallow Arches soil on eolian-mantled areas

Characteristics of Rock outcrop

Rock outcrop consists of exposures of sandstone bedrock. It occurs as gently to moderately sloping slickrock intermixed with the Rizno soil, and as steeply sloping to vertical cliffs. There is little or no vegetation, and surface runoff is rapid to very rapid.

Characteristics of the Rizno Soil

Typical profile:

- 0 to 4 inches—yellowish red fine sandy loam
- 4 to 6 inches—red gravelly fine sandy loam
- 6 inches—sandstone bedrock

Parent material: Eolian material and residuum derived from sandstone

Depth class: Very shallow

Drainage class: Well drained

Permeability: Moderately rapid

Available water capacity: Very low

Surface runoff: Rapid

Hazard of water erosion: Severe

Hazard of soil blowing: Severe

Major Uses

Livestock grazing

Woodland production

Livestock grazing

Dominant understory vegetation in potential plant community:

Stansbury cliffrose, Bigelow sagebrush, Indian ricegrass, New Mexico feathergrass, galleta, blue grama, broom snakeweed, green Mormon tea, southwest rabbitbrush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—500

Unfavorable years—300

Present understory plant community:

Indian ricegrass, New Mexico feathergrass, cheatgrass, Bigelow sagebrush, broom snakeweed, Stansbury cliffrose

Major limitations: hazard of water erosion, hazard of soil blowing, depth to bedrock, presence of rock outcrops

Suitable management practices and concerns:

- The density of the canopy is generally less than 25 percent and produces understory plants suitable for grazing.
- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Vary the season of grazing and the periods of rest during successive years.
- Suitability for mechanical range seeding is poor because of soil factors and/or tree density.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of water erosion and soil blowing by preventing overgrazing, maintaining adequate

plant cover, and allowing plant litter to accumulate on the surface.

Woodland production

Dominant overstory vegetation:

Utah juniper (75%), pinyon (25%)

Average site index: 20

Major limitations: hazard of water erosion, hazard of soil blowing, equipment limitations, seedling mortality, windthrow hazard, low productivity

Suitable management practices and concerns:

- The potential is poor for harvesting wood products such as fuelwood, fence posts, Christmas trees, and ornamental trees.
- Maintaining the understory vegetation is essential in controlling erosion.
- The use of wheeled equipment in harvesting the limited wood products on this soil is severely restricted in most places because of the presence of slopes over 15 percent and numerous rock outcrops.
- Tree seedlings have a low rate of survival because of high summer temperatures and the very low water holding capacity of the soil.
- Reduce the problem of seedling mortality by leaving the larger trees to provide shade for seedling trees.
- Because roots are restricted by bedrock, trees have a severe hazard of windthrow when the soil is excessively wet and winds are strong.
- To reduce the hazard of windthrow, avoid cutting trees, limit the width of maintained roads, and avoid making new openings in the canopy.

Interpretive Groups

Land capability classification: **Rock outcrop**—nonirrigated—8s; **Rizno**—nonirrigated—7s

Range site: **Rock outcrop**—not assigned; **Rizno**—not assigned (pj woodland)

310—Millett-Blanding-Strych association, 2 to 50 percent slopes

Setting

Landform: Fan terraces and toeslopes

Position on the landform: **Millett**—treads of fan terraces; **Blanding**—eolian-mantled toeslopes; **Strych**—risers of fan terraces

Slope: **Millett**—2 to 6 percent; **Blanding**—2 to 8 percent; **Strych**—15 to 50 percent

Shape of areas: Irregular

Size of areas: 200 to 2,000 acres

Elevation: 5,600 to 6,200 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F

Frost-free period: 130 to 150 days

Composition

Millett gravelly fine sandy loam and similar soils: 55 percent

Blanding very fine sandy loam and similar soils: 20 percent

Strych very cobbly fine sandy loam, extremely stony and similar soils: 15 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- The very shallow Rizno soil on structural benches
- Soils similar to Millett with indurated pans between 20 and 40 inches on treads of fan terraces
- Rock outcrop as exposures of sandstone bedrock occurring as ledges at the base of risers

Characteristics of the Millett Soil

Typical profile:

- 0 to 2 inches—yellowish red gravelly fine sandy loam
- 2 to 6 inches—reddish brown gravelly fine sandy loam
- 6 to 16 inches—light reddish brown gravelly sandy clay loam
- 16 to 31 inches—white very gravelly sandy loam
- 31 to 64 inches—pink and reddish brown very cobbly sandy loam

Parent material: Alluvium derived from sandstone and quartz diorite

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Low to moderate

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Severe

Characteristics of the Blanding Soil

Typical profile:

- 0 to 2 inches—reddish brown very fine sandy loam
- 2 to 9 inches—reddish brown very fine sandy loam
- 9 to 24 inches—yellowish red loam
- 24 to 63 inches—light reddish brown and yellowish red loam and sandy clay loam

Parent material: Eolian material derived from siltstone and sandstone

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: High

Surface runoff: Slow

Hazard of water erosion: Severe

Hazard of soil blowing: Moderate

Characteristics of the Strych Soil

Typical profile:

- 0 to 1 inch—yellowish red very cobbly fine sandy loam
- 1 to 5 inches—reddish brown gravelly fine sandy loam
- 5 to 42 inches—pink and light reddish brown very cobbly fine sandy loam
- 42 to 66 inches—yellowish red gravelly fine sandy loam

Parent material: Alluvium derived from sandstone and quartz diorite

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately rapid

Available water capacity: Low to moderate

Surface runoff: Rapid

Hazard of water erosion: Very severe

Hazard of soil blowing: Slight

Major Uses

Livestock grazing

Millett soil

Dominant vegetation in potential plant community: needleandthread, galleta, Indian ricegrass, Utah juniper, bottlebrush squirreltail, blue grama, winterfat, Wyoming big sagebrush, broom snakeweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—800

Unfavorable years—400

Present plant community:

needleandthread, galleta, Utah juniper, broom snakeweed

Blanding soil

Dominant vegetation in potential plant community: galleta, western wheatgrass, needleandthread, blue grama, bottlebrush squirreltail, Indian ricegrass, Wyoming big sagebrush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—1,000

Unfavorable years—600

Present plant community:

galleta, sand dropseed, Fendler threeawn, broom snakeweed, Wyoming big sagebrush

Strych soil

Dominant vegetation in potential plant community: needleandthread, black grama, galleta, Indian

ricegrass, Utah juniper, sand dropseed, blue grama, Wyoming big sagebrush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—800

Unfavorable years—400

Present plant community:

needleandthread, galleta, blue grama, Indian ricegrass, sand dropseed, Utah juniper, Wyoming big sagebrush

Major limitations:

Millett—hazard of soil blowing, subsurface rock fragments

Blanding—hazard of soil blowing

Strych—hazard of water erosion, steep slopes, subsurface rock fragments

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Vary the season of grazing and the periods of rest during successive years.
- Uniform distribution of grazing is difficult because of the slope or the lack of permanent water developments, or both.
- Livestock prefer to graze the easily accessible areas before they graze the steep slopes.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Blanding soil

- Range seeding may be needed if the better forage plants have decreased.
- Suitability for range seeding is fair because of climate factors.
- If shrubs are managed to create open areas, a good stand of desirable grasses and forbs can be produced.
- Manage the brush in areas where unpalatable brushy plants have increased significantly. Control the brush by mechanical means or prescribed burning.
- Seed the range if the plant cover is not sufficient to protect the soil from erosion.
- Seed late in the fall for best results.

- After seeding, defer grazing until the young plants are well established.

Millett and Strych soils

- Suitability for mechanical range seeding is poor because of soil factors.

Interpretive Groups

Land capability classification: **Millett**—nonirrigated—6c; **Blanding**—nonirrigated—6c; **Rock outcrop**—nonirrigated—8s

Range site: **Millett**—Loamy Upland (gravelly) 10-14" p.z.; **Blanding**—Loamy Upland 10-14" p.z.; **Rock outcrop**—not assigned

311—Kinusta-Eslendo-Rock outcrop complex, 15 to 70 percent slopes

Setting

Landform: Escarpments of mesas

Position on the landform: **Kinusta**—lower backslopes; **Eslendo**—upper backslopes; **Rock outcrop**—cliffs

Slope: **Kinusta**—15 to 60 percent; **Eslendo**—35 to 70 percent

Shape of areas: Elongate

Size of areas: 100 to 1,000 acres

Elevation: 5,200 to 6,600 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F

Frost-free period: 130 to 150 days

Composition

Kinusta channery very fine sandy loam and similar soils: 50 percent

Eslendo very channery fine sandy loam, extremely bouldery and similar soils: 25 percent

Rock outcrop: 10 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The very deep Strych soil, rubbly phase, on small, stable landslides
- The very deep, coarse textured Mido soil on steep, stable dunes
- The coarse textured Arches soil on small structural benches along the Utah line
- The very shallow Rizno soil on small structural benches in the Redrock Valley

- Badland as barren exposures of siltstone or shale

Characteristics of the Kinusta Soil

Typical profile:

- 0 to 3 inches—red channery very fine sandy loam
- 3 to 17 inches—red very fine sandy loam
- 17 inches—siltstone bedrock

Parent material: Alluvium, colluvium, and residuum derived from siltstone and sandstone

Depth class: Shallow

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Very low

Surface runoff: Rapid

Hazard of water erosion: Very severe

Hazard of soil blowing: Severe

Sodicity: Slightly sodic below a depth of 3 inches

Characteristics of the Eslendo Soil

Typical profile:

- 0 to 3 inches—reddish brown very channery fine sandy loam
- 3 to 18 inches—brown and light brownish gray clay loam and loam
- 18 inches—siltstone and soft sandstone bedrock

Parent material: Colluvium and residuum derived from sandstone, siltstone, and shale

Depth class: Shallow

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Very low

Surface runoff: Rapid

Hazard of water erosion: Very severe

Hazard of soil blowing: Moderate

Characteristics of Rock outcrop

Rock outcrop consists of exposures of sandstone bedrock. It occurs as vertical cliffs ranging from 10 to 50 feet high, and as small ledges. There is little or no vegetation, and surface runoff is rapid to very rapid.

Major Uses

Livestock grazing

Kinusta soil

Dominant vegetation in potential plant community:

Indian ricegrass, galleta, muttongrass, Torrey Mormon tea, needleandthread, bottlebrush squirreltail, Utah juniper, broom snakeweed, antelope bitterbrush, narrowleaf yucca, Bigelow sagebrush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—850

Unfavorable years—450

Present plant community:

galleta, Indian ricegrass, needleandthread, broom snakeweed, Torrey Mormon tea, Utah juniper

Eslendo soil

Dominant vegetation in potential plant community:

salina wildrye, muttongrass, Wyoming big sagebrush, Indian ricegrass, plains bluegrass, roundleaf buffaloberry, green Mormon tea, golden buckwheat

Annual production of air-dry vegetation (pounds per acre):

Favorable years—550

Unfavorable years—350

Present plant community:

salina wildrye, muttongrass, Indian ricegrass, Wyoming big sagebrush, roundleaf buffaloberry, green Mormon tea

Major limitations:

Kinusta—hazard of water erosion, hazard of soil blowing, steep slopes, depth to bedrock, presence of rock outcrops

Eslendo—hazard of water erosion, hazard of soil blowing, steep slopes, depth to bedrock, presence of rock outcrops, surface rock fragments

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of soil factors.
- Uniform distribution of grazing is difficult because of the slope or the lack of permanent water developments, or both.
- Livestock prefer to graze the easily accessible areas before they graze the steep slopes.
- Vary the season of grazing and the periods of rest during successive years.
- Control the time and amount of use by livestock.
- Reduce the risk of water erosion and soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Kinusta**—

nonirrigated—7s; **Eslendo**—nonirrigated—7e;

Rock outcrop—nonirrigated—8s

Range site: **Kinusta**—Breaks 10-14" p.z.; **Eslendo**—Clayey Slopes (bouldery) 10-14" p.z.; **Rock outcrop**—not assigned

312—Blanding very fine sandy loam, 2 to 8 percent slopes

Setting

Landform: Eolian-mantled fan terraces and mesas

Shape of areas: Irregular

Size of areas: 50 to 500 acres

Elevation: 5,500 to 6,500 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F

Frost-free period: 130 to 150 days

Composition

Blanding soil and similar soils: 90 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- The moderately coarse textured Kitsili soil on fan terraces
- Blanding soils that are eroded on steep backslopes
- The moderately deep Sanostee soil on structural benches southwest of Red Rock, Arizona
- Riverwash in wash channels
- Very deep, stratified soils which are lower in clay and occur on rarely flooded low stream terraces and frequently flooded alluvial fans along Boiling Over Wash, and in the upper part of Alcove Canyon in Arizona

Typical Profile

- 0 to 3 inches—reddish brown very fine sandy loam
- 3 to 9 inches—reddish brown very fine sandy loam
- 9 to 37 inches—reddish brown loam
- 37 to 66 inches—light reddish brown and reddish yellow loam and sandy clay loam

Soil Properties and Qualities

Parent material: Eolian material derived from siltstone and sandstone

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: High

Surface runoff: Slow

Hazard of water erosion: Severe

Hazard of soil blowing: Moderate

Major Uses

Livestock grazing

Dominant vegetation in potential plant community: galleta, western wheatgrass, needleandthread, blue grama, Indian ricegrass, bottlebrush squirreltail, Wyoming big sagebrush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—1,000

Unfavorable years—600

Present plant community:

Wyoming big sagebrush, broom snakeweed, needleandthread, blue grama, galleta

Major limitations: hazard of soil blowing

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.
- Range seeding may be needed if the better forage plants have decreased (fig. 8).
- Suitability for range seeding is fair because of climate factors.
- If shrubs are managed to create open areas, a good stand of desirable grasses and forbs can be produced.
- Manage the brush in areas where unpalatable brushy plants have increased significantly. Control the brush by mechanical means or prescribed burning.
- Seed the range if the plant cover is not sufficient to protect the soil from erosion.
- Seed late in the fall for best results.
- After seeding, defer grazing until the young plants are well established.

Interpretive Groups

Land capability classification: Nonirrigated—6c

Range site: Loamy Upland 10-14" p.z.



Figure 8.—This area of Blanding very fine sandy loam, 2 to 8 percent slopes, is in the Loamy Upland range site. Wyoming big sagebrush has increased here to the point that it now dominates over more palatable plants. The suitability for mechanical range reseeding is fair on this very deep soil because of the semiarid climate in which it occurs.

313—Marjane-Kitsili complex, 2 to 8 percent slopes

Setting

Landform: Mesas and plateaus

Position on the landform: **Marjane**—footslopes and summits; **Kitsili**—eolian-mantled summits

Slope: **Marjane**—2 to 5 percent; **Kitsili**—3 to 8 percent

Shape of areas: Irregular

Size of areas: 100 to 1,000 acres

Elevation: 5,600 to 6,500 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F

Frost-free period: 130 to 150 days

Composition

Marjane fine sandy loam and similar soils: 45 percent

Kitsili loamy fine sand and similar soils: 40 percent
Contrasting inclusions: 15 percent

Contrasting Inclusions

- The coarse textured Mido soil on stable dunes
- The very shallow Rizno soil on summits of structural benches
- The moderately fine textured Doakum and Blanding soils on eolian-mantled toeslopes

Characteristics of the Marjane Soil

Typical profile:

- 0 to 2 inches—yellowish red fine sandy loam
- 2 to 18 inches—yellowish red fine sandy loam
- 18 to 28 inches—light reddish brown fine sandy loam
- 28 inches—sandstone bedrock

Parent material: Eolian material and residuum derived from sandstone

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Low

Surface runoff: Slow

Hazard of water erosion: Moderate

Hazard of soil blowing: Severe

Characteristics of the Kitsili Soil

Typical profile:

- 0 to 10 inches—reddish brown and yellowish red loamy fine sand
- 10 to 19 inches—yellowish red and reddish brown fine sandy loam
- 19 to 65 inches—reddish brown fine sandy loam

Parent material: Eolian material and alluvium derived from sandstone

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately rapid

Available water capacity: High

Surface runoff: Slow

Hazard of water erosion: Moderate

Hazard of soil blowing: Very severe

Major Uses

Livestock grazing

Marjane soil

Dominant vegetation in potential plant community:

Indian ricegrass, needleandthread, blue grama, galleta, sand dropseed, Cutler Mormon tea, broom snakeweed, Greene rabbitbrush, Wyoming big sagebrush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—900

Unfavorable years—400

Present plant community:

Indian ricegrass, galleta, broom snakeweed, Greene rabbitbrush, Cutler Mormon tea

Kitsili soil

Dominant vegetation in potential plant community:

Indian ricegrass, needleandthread, blue grama, galleta, sand dropseed, Cutler Mormon tea, broom snakeweed, Greene rabbitbrush, Wyoming big sagebrush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—900

Unfavorable years—400

Present plant community:

blue grama, galleta, Indian ricegrass, broom snakeweed, Greene rabbitbrush, Cutler Mormon tea

Major limitations: hazard of soil blowing

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Provide periodic rest during spring in alternate years.
- Reduce the risk of soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.
- Range seeding may be needed if the better forage plants have decreased.
- Suitability for range seeding is fair because of soil and climate factors.
- If shrubs are managed to create open areas, a good stand of desirable grasses and forbs can be produced.
- Manage the brush in areas where unpalatable brushy plants have increased significantly. Control the brush by mechanical means or prescribed burning.
- Seed the range if the plant cover is not sufficient to protect the soil from erosion.
- Seed late in the fall for best results.
- After seeding, defer grazing until the young plants are well established.

Interpretive Groups

Land capability classification: **Marjane**—

nonirrigated—6c; **Kitsili**—nonirrigated—6c

Range site: **Marjane**—Sandy Loam Upland 10-14"

p.z.; **Kitsili**—Sandy Loam Upland 10-14" p.z.

314—Mido loamy fine sand, 8 to 45 percent slopes

Setting

Landform: Escarpments of mesas and cuevas

Position on the landform: Stable dunes on footslopes and backslopes

Shape of areas: Irregular

Size of areas: 50 to 800 acres

Elevation: 5,600 to 6,300 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F

Frost-free period: 130 to 150 days

Composition

Mido soil and similar soils: 90 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- The moderately coarse textured Kitsili soil on fan terraces
- Riverwash in washes
- The rubbly surfaced Strych soil on small, stable landslides below Toh Atin Mesa

Typical Profile

- 0 to 7 inches—yellowish red loamy fine sand
- 7 to 62 inches—yellowish red loamy fine sand

Soil Properties and Qualities

Parent material: Eolian material derived from sandstone

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Rapid

Available water capacity: Low to moderate

Surface runoff: Medium

Hazard of water erosion: Very severe

Hazard of soil blowing: Very severe

Major Uses

Livestock grazing

Dominant vegetation in potential plant community: needleandthread, Indian ricegrass, sand dropseed, sandhill muhly, Cutler Mormon tea, fourwing saltbush, antelope bitterbrush, broom snakeweed, Bigelow rubber rabbitbrush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—900

Unfavorable years—400

Present plant community:

sandhill muhly, Indian ricegrass, needleandthread, Cutler Mormon tea, broom snakeweed, Bigelow rubber rabbitbrush

Major limitations: hazard of soil blowing, hazard of water erosion

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of soil factors.
- Uniform distribution of grazing is difficult because of the slope or the lack of permanent water developments, or both.

- Livestock prefer to graze the easily accessible areas before they graze the steep slopes.
- Promote uniform grazing by properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Vary the season of grazing and the periods of rest during successive years.
- Control the time and amount of use by livestock.
- Provide periodic rest during spring in alternate years.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: Nonirrigated—7e

Range site: Sandy Upland 10-14" p.z.

315—Shoegame-Riverwash complex, 2 to 5 percent slopes

Setting

Landform: Valley floors

Position on the landform: **Shoegame**—low stream terraces; **Riverwash**—washes

Shape of areas: Elongate

Size of areas: 100 to 500 acres

Elevation: 5,000 to 6,400 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F

Frost-free period: 130 to 150 days

Composition

Shoegame very cobbly sandy loam, extremely stony and similar soils: 70 percent

Riverwash: 20 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- Frequently flooded soils on narrow flood plains
- The moderately fine textured Millett soil on treads of fan terraces
- Rock outcrop as exposures of sandstone bedrock occurring as ledges along wash channels

Characteristics of the Shoegame Soil

Typical profile:

- 0 to 4 inches—light brown very cobbly sandy loam
- 4 to 13 inches—light brown very gravelly loamy coarse sand

- 13 to 19 inches—brown cobbly fine sandy loam
- 19 to 44 inches—pinkish gray extremely cobbly coarse sand
- 44 to 65 inches—light brown extremely stony coarse sand

Parent material: Alluvium derived from quartz diorite and sandstone

Depth class: Very deep

Drainage class: Excessively drained

Permeability: Moderately rapid

Available water capacity: Very low

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Moderate

Flooding frequency: Rare

Characteristics of Riverwash

Riverwash consists of unstable sand, silt, cobbles, and stones that is reworked by streams so frequently that it supports little or no vegetation. Riverwash is subject to frequent, very brief periods of flooding from prolonged high-intensity storms.

Major Uses

Livestock grazing

Dominant vegetation in potential plant community:

Indian ricegrass, blue grama, galleta, sand dropseed, Utah juniper, Wyoming big sagebrush, Bigelow rubber rabbitbrush, Fendler threeawn, broom snakeweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—1,000

Unfavorable years—400

Present plant community:

galleta, Fendler threeawn, sand dropseed, blue grama, Indian ricegrass, Utah juniper, broom snakeweed, Bigelow rubber rabbitbrush

Major limitations:

Shoegame—hazard of soil blowing, surface and subsurface rock fragments, very low water holding capacity

Riverwash—frequent flooding, rock fragments

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly

locating watering facilities, properly distributing salt licks, and proper stocking.

- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Shoegame**—

nonirrigated—7s; **Riverwash**—nonirrigated—8s

Range site: **Shoegame**—Sandy Terrace (stony) 10-14" p.z.; **Riverwash**—not assigned

316—Millett-Strych-Doakum complex, 5 to 65 percent slopes

Setting

Landform: Broad, stable landslides (fig. 9)

Position on the landform: **Millett**—footslopes and shoulders; **Strych**—backslopes; **Doakum**—toeslopes

Slope: **Millett**—10 to 35 percent; **Strych**—35 to 65 percent; **Doakum**—5 to 15 percent

Shape of areas: Irregular

Size of areas: 200 to 2,000 acres

Elevation: 6,000 to 7,000 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F

Frost-free period: 130 to 150 days

Composition

Millett very cobbly fine sandy loam, very bouldery and similar soils: 50 percent

Strych extremely cobbly fine sandy loam, rubbly and similar soils: 25 percent

Doakum fine sandy loam and similar soils: 15 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- The moderately deep, fine textured Bodot soil on footslopes
- Badland of barren shale on backslopes
- The sodic Beclabito soil on toeslopes

Characteristics of the Millett Soil

Typical profile:

- 0 to 2 inches—brown very cobbly fine sandy loam
- 2 to 14 inches—brown cobbly sandy clay loam
- 14 to 26 inches—pinkish gray very cobbly fine sandy loam
- 26 to 63 inches—pinkish white and light brown very

cobbly fine sandy loam and very gravelly fine sandy loam

Parent material: Alluvium and colluvium derived from sandstone

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Low to moderate

Surface runoff: Rapid

Hazard of water erosion: Severe

Hazard of soil blowing: Slight

Characteristics of the Strych Soil

Typical profile:

- 0 to 2 inches—brown extremely cobbly fine sandy loam
- 2 to 16 inches—brown and pinkish gray very stony fine sandy loam

- 16 to 28 inches—white very stony fine sandy loam
- 28 to 53 inches—pink very stony fine sandy loam
- 53 to 64 inches—pinkish gray very stony loamy fine sand

Parent material: Colluvium derived from sandstone

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately rapid

Available water capacity: Low to moderate

Surface runoff: Very rapid

Hazard of water erosion: Severe

Hazard of soil blowing: Very slight

Characteristics of the Doakum Soil

Typical profile:

- 0 to 3 inches—brown fine sandy loam
- 3 to 16 inches—dark brown and brown sandy clay loam



Figure 9.—Millett very cobbly fine sandy loam, very bouldery, within an area of Millett-Strych-Doakum complex, 5 to 65 percent slopes. This map unit occurs on broad, stable landslides primarily below the Chuska Mountains in New Mexico.

- 16 to 46 inches—light brown and brown sandy clay loam
- 46 to 80 inches—brown fine sandy loam

Parent material: Eolian material and alluvium derived from sandstone and shale

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: High

Surface runoff: Medium

Hazard of water erosion: Moderate

Hazard of soil blowing: Moderate

Major Uses

Livestock grazing

Millett soil

Dominant vegetation in potential plant community:

Indian ricegrass, galleta, needleandthread, blue grama, black grama, bottlebrush squirreltail, Utah juniper, plains pricklypear, broom snakeweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—800

Unfavorable years—400

Present plant community:

galleta, blue grama, Fendler threeawn, needleandthread, broom snakeweed, Utah juniper

Strych soil

Dominant vegetation in potential plant community:

New Mexico feathergrass, needleandthread, Indian ricegrass, muttongrass, Utah juniper, Bigelow sagebrush, desert needlegrass, black grama, galleta, green Mormon tea

Annual production of air-dry vegetation (pounds per acre):

Favorable years—850

Unfavorable years—450

Present plant community:

galleta, blue grama, needleandthread, black grama, Utah juniper, Bigelow sagebrush

Doakum soil

Dominant vegetation in potential plant community:

blue grama, galleta, Indian ricegrass, needleandthread, western wheatgrass, sand dropseed, Wyoming big sagebrush, fourwing saltbush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—1,000

Unfavorable years—600

Present plant community:

blue grama, galleta, Wyoming big sagebrush, broom snakeweed

Major limitations:

Millett—hazard of water erosion, surface and subsurface rock fragments

Strych—hazard of water erosion, steep slopes, surface and subsurface rock fragments

Doakum—hazard of water erosion, hazard of soil blowing

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Uniform distribution of grazing is difficult because of the slope or the lack of permanent water developments, or both.
- Livestock prefer to graze the easily accessible areas before they graze the steep slopes.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Vary the season of grazing and the periods of rest during successive years.
- Control the time and amount of use by livestock.
- Provide periodic rest during spring in alternate years.
- Reduce the risk of water erosion and soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Millett and Strych soils

- Suitability for range seeding is poor because of soil factors.

Doakum soil

- Range seeding may be needed if the better forage plants have decreased.
- Suitability for range seeding is fair because of climate factors.
- Seed the range if the plant cover is not sufficient to protect the soil from erosion.
- Seed late in the fall for best results.
- After seeding, defer grazing until the young plants are well established.

Interpretive Groups

Land capability classification: **Millett**—nonirrigated—6c; **Strych**—nonirrigated—7s; **Doakum**—nonirrigated—6c

Range site: **Millett**—Cobbly Slopes 10-14" p.z.; **Strych**—Breaks 10-14" p.z.; **Doakum**—Loamy Upland 10-14" p.z.

317—Toadlena-Eagleeye complex, 2 to 60 percent slopes

Setting

Landform: Structural benches

Position on the landform: **Toadlena**—summits and footslopes; **Eagleeye**—backslopes

Slope: **Toadlena**—2 to 20 percent; **Eagleeye**—20 to 60 percent

Shape of areas: Irregular

Size of areas: 100 to 2,000 acres

Elevation: 6,100 to 6,900 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F

Frost-free period: 130 to 150 days

Composition

Toadlena channery loam and similar soils: 50 percent
Eagleeye very channery clay loam and similar soils: 40 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- Rock outcrop as exposures of sandstone bedrock occurring as small cliffs
- The very deep Doakum soil on eolian-mantled toeslopes
- The very deep and rubbly Strych soil on backslopes of small, dissected landslides

Characteristics of the Toadlena Soil

Typical profile:

- 0 to 1 inch—light yellowish brown channery loam
- 1 to 12 inches—light yellowish brown and pale brown gypsiferous material which is an apparent loam
- 12 to 18 inches—light brownish gray and light yellowish brown silty clay loam
- 18 inches—siltstone and shale bedrock

Parent material: Alluvium and residuum derived from siltstone and shale

Depth class: Shallow

Drainage class: Well drained

Permeability: Moderately slow

Available water capacity: Very low

Surface runoff: Medium

Hazard of water erosion: Moderate

Hazard of soil blowing: Severe

Salinity: Moderately saline below a depth of 12 inches

Sodicity: Slightly sodic

Characteristics of the Eagleeye Soil

Typical profile:

- 0 to 2 inches—grayish brown very channery clay loam
- 2 to 16 inches—grayish brown silty clay
- 16 inches—shale bedrock

Parent material: Alluvium and residuum derived from shale

Depth class: Shallow

Drainage class: Well drained

Permeability: Slow

Available water capacity: Very low

Surface runoff: Rapid

Hazard of water erosion: Very severe

Hazard of soil blowing: Moderate

Salinity: Slightly saline below a depth of 6 inches

Sodicity: Slightly sodic below a depth of 2 inches

Shrink-swell potential: High

Major Uses

Livestock grazing

Toadlena soil

Dominant vegetation in potential plant community:

alkali sacaton, galleta, Indian ricegrass, blue grama, Bigelow sagebrush, shadscale, winterfat, Torrey Mormon tea

Annual production of air-dry vegetation (pounds per acre):

Favorable years—450

Unfavorable years—250

Present plant community:

galleta, alkali sacaton, blue grama, Bigelow sagebrush, shadscale, winterfat, slenderleaf buckwheat

Eagleeye soil

Dominant vegetation in potential plant community:

shadscale, galleta, alkali sacaton, Indian ricegrass, bottlebrush squirreltail, Bigelow sagebrush, slenderleaf buckwheat, Utah juniper

Annual production of air-dry vegetation (pounds per acre):

Favorable years—650

Unfavorable years—250

Present plant community:

galleta, alkali sacaton, shadscale, slenderleaf buckwheat, Utah juniper

Major limitations:

Toadlena—hazard of soil blowing, hazard of water erosion, depth to bedrock, salinity

Eagleye—hazard of water erosion, hazard of soil blowing, steep slopes, shrink-swell potential

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of soil factors.
- Uniform distribution of grazing is difficult because of the slope or the lack of permanent water developments, or both.
- Livestock prefer to graze the easily accessible areas before they graze the steep slopes.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Vary the season of grazing and the periods of rest during successive years.
- Control the time and amount of use by livestock.
- Provide periodic rest during spring in alternate years.
- Reduce the risk of water erosion and soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Toadlena**—nonirrigated—7s; **Eagleye**—nonirrigated—7e

Range site: **Toadlena**—Silty Shallow 10-14" p.z.;

Eagleye—Clayey Slopes 10-14" p.z.

318—Camino silty clay loam, 1 to 8 percent slopes

Setting

Landform: Toeslopes

Shape of areas: Irregular

Size of areas: 20 to 200 acres

Elevation: 6,200 to 7,000 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F

Frost-free period: 130 to 150 days

Composition

Camino soil and similar soils: 85 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The moderately fine textured, nonsodic Doakum and Millett soils on areas of this map unit west of Sheep Springs and Sanostee

- The shallow Toadlena soil on structural benches west of Sanostee

- Gullied land along small washes

Typical Profile

- 0 to 3 inches—brown silty clay loam
- 3 to 28 inches—grayish brown and brown silty clay and silty clay loam
- 28 to 68 inches—grayish brown and brown silty clay loam

Soil Properties and Qualities

Parent material: Alluvium derived from shale and siltstone

Depth class: Very deep

Drainage class: Well drained

Permeability: Slow

Available water capacity: High to very high

Surface runoff: Medium

Hazard of water erosion: Severe

Hazard of soil blowing: Moderate

Salinity: Very slightly saline below a depth of 28 inches

Sodicity: Moderately sodic below a depth of 9 inches

Major Uses

Livestock grazing

Dominant vegetation in potential plant community:

alkali sacaton, galleta, blue grama, Indian ricegrass, bottlebrush squirreltail, mound saltbush, broom snakeweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—700

Unfavorable years—400

Present plant community:

alkali sacaton, galleta, blue grama, broom snakeweed, mound saltbush

Major limitations: hazard of water erosion, hazard of soil blowing, sodicity

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Provide periodic rest during spring in alternate years.
- Reduce the risk of erosion by preventing

overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

- Range seeding may be needed if the better forage plants have decreased.
- Suitability for range seeding is fair because of climate factors.
- Seed the range if the plant cover is not sufficient to protect the soil from erosion.
- Seed late in the fall for best results.
- After seeding, defer grazing until the young plants are well established.

Interpretive Groups

Land capability classification: Nonirrigated—6c

Range site: Clay Loam Upland 10-14" p.z.

319—Skyhawk-Lavellga association, 5 to 50 percent slopes

Setting

Landform: Dissected fan terraces

Position on the landform: **Skyhawk**—risers of fan terraces; **Lavellga**—treads of fan terraces

Slope: **Skyhawk**—35 to 50 percent; **Lavellga**—5 to 15 percent

Shape of areas: Irregular

Size of areas: 100 to 1,000 acres

Elevation: 5,800 to 7,200 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F

Frost-free period: 130 to 150 days

Composition

Skyhawk extremely gravelly sandy loam, extremely stony and similar soils: 50 percent

Lavellga very channery fine sandy loam, very stony and similar soils: 35 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The shallow, fine textured Eagleye soil on steep backslopes
- The very deep, non-skeletal Doakum soil on eolian-mantled fan terraces
- Rock outcrop as exposures of basalt or tuff-breccia bedrock occurring as cliffs associated with isolated volcanic necks

Characteristics of the Skyhawk Soil

Typical profile:

- 0 to 2 inches—brown extremely gravelly sandy loam
- 2 to 6 inches—brown gravelly clay loam

- 6 to 35 inches—very pale brown, light gray, and light brownish gray silty clay loam

- 35 inches—siltstone and shale bedrock

Parent material: Alluvium derived from basalt and residuum derived from siltstone

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Moderately slow

Available water capacity: Moderate

Surface runoff: Rapid

Hazard of water erosion: Severe

Hazard of soil blowing: Very slight

Salinity: Very slightly saline below a depth of 23 inches

Characteristics of the Lavellga Soil

Typical profile:

- 0 to 2 inches—brown very channery fine sandy loam

- 2 to 6 inches—brown very gravelly sandy clay loam

- 6 to 13 inches—light brown very gravelly sandy loam

- 13 to 50 inches—white very cobbly sandy loam and extremely cobbly sandy loam

- 50 to 65 inches—pinkish gray very cobbly sandy loam

Parent material: Alluvium derived from basalt and sandstone

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately rapid

Available water capacity: Very low to low

Surface runoff: Medium

Hazard of water erosion: Slight

Hazard of soil blowing: Slight

Major Uses

Livestock grazing

Skyhawk soil

Dominant vegetation in potential plant community:

New Mexico feathergrass, blue grama, galleta, Indian ricegrass, black grama, shadscale, fourwing saltbush, broom snakeweed, Utah juniper

Annual production of air-dry vegetation (pounds per acre):

Favorable years—800

Unfavorable years—400

Present plant community:

New Mexico feathergrass, blue grama, shadscale, Utah juniper

Lavellga soil

Dominant vegetation in potential plant community:

New Mexico feathergrass, blue grama, Indian

ricegrass, galleta, fourwing saltbush, broom snakeweed, Utah juniper

Annual production of air-dry vegetation (pounds per acre):

Favorable years—800

Unfavorable years—400

Present plant community:

New Mexico feathergrass, blue grama, galleta, Indian ricegrass, fourwing saltbush, Utah juniper

Major limitations:

Skyhawk—hazard of water erosion, steep slopes, surface rock fragments

Lavellga—very low water holding capacity, surface and subsurface rock fragments

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Vary the season of grazing and the periods of rest during successive years.
- Suitability for range seeding is poor because of soil factors.
- Uniform distribution of grazing is difficult because of the slope or the lack of permanent water developments, or both.
- Livestock prefer to graze the easily accessible areas before they graze the steep slopes.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Provide periodic rest during spring in alternate years.
- Reduce the risk of water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Skyhawk**—

nonirrigated—7e; **Lavellga**—nonirrigated—6s

Range site: **Skyhawk**—Cobbly Slopes 10-14" p.z.;

Lavellga—Loamy Upland (gravelly) 10-14" p.z.

320—Beclabito-Kinusta-Badland complex, 2 to 45 percent slopes

Setting

Landform: Structural benches

Position on the landform: **Beclabito**—summits and footslopes; **Kinusta**—backslopes; **Badland**—barren backslopes

Slope: **Beclabito**—2 to 15 percent; **Kinusta**—15 to 45 percent

Shape of areas: Irregular

Size of areas: 20 to 500 acres

Elevation: 5,600 to 6,400 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F

Frost-free period: 130 to 150 days

Composition

Beclabito very fine sandy loam and similar soils: 45 percent

Kinusta very gravelly loam, very stony and similar soils: 25 percent

Badland: 15 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- Strongly sodic, very deep soils that have very gravelly surface horizons, on eroded footslopes and dissected fan terraces
- Shallow, sodic soils over hard limestone bedrock on eroded summits
- The very deep, nonsodic Blanding soil on eolian-mantled summits and toeslopes
- Riverwash in frequently flooded washes

Characteristics of the Beclabito Soil

Typical profile:

- 0 to 7 inches—reddish brown very fine sandy loam
- 7 to 24 inches—reddish brown and light reddish brown very fine sandy loam and loam
- 24 to 31 inches—light reddish brown loam
- 31 to 37 inches—reddish brown very fine sandy loam
- 37 inches—siltstone bedrock

Parent material: Eolian material, alluvium, and residuum derived from siltstone and limestone

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Moderate

Surface runoff: Medium

Hazard of water erosion: Very severe

Hazard of soil blowing: Severe

Salinity: Moderately saline below a depth of 31 inches

Sodicity: Strongly sodic below a depth of 24 inches

Characteristics of the Kinusta Soil

Typical profile:

- 0 to 3 inches—light reddish brown very gravelly loam
- 3 to 16 inches—light red and reddish brown silt loam

- 16 inches—mudstone bedrock

Parent material: Colluvium and residuum derived from limestone and mudstone

Depth class: Shallow

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Very low

Surface runoff: Rapid

Hazard of water erosion: Severe

Hazard of soil blowing: Moderate

Characteristics of Badland

Badland consists of exposures of barren mudstone and siltstone bedrock. It occurs on steep, convex backslopes adjacent to bodies of the Kinusta soil. There is little or no vegetation, and surface runoff is rapid.

Major Uses

Livestock grazing

Beclabito soil

Dominant vegetation in potential plant community: alkali sacaton, galleta, shadscale, blue grama, Indian ricegrass, bottlebrush squirreltail, broom snakeweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—600

Unfavorable years—400

Present plant community:

alkali sacaton, galleta, blue grama, shadscale, Fendler threeawn, broom snakeweed

Kinusta soil

Dominant vegetation in potential plant community:

Indian ricegrass, galleta, muttongrass, Torrey Mormon tea, Bigelow sagebrush, Utah juniper, antelope bitterbrush, narrowleaf yucca, broom snakeweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—850

Unfavorable years—450

Present plant community:

galleta, Indian ricegrass, blue grama, Fendler threeawn, Stansbury cliffrose, Bigelow rubber rabbitbrush, Utah juniper, pinyon

Major limitations:

Beclabito—hazard of soil blowing, hazard of water erosion, sodicity

Kinusta—hazard of water erosion, hazard of soil blowing, steep slopes, depth to bedrock

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in

a deteriorated plant community that has low value as forage.

- Vary the season of grazing and the periods of rest during successive years.
- Suitability for range seeding is poor because of soil factors.
- Uniform distribution of grazing is difficult because of the slope or the lack of permanent water developments, or both.
- Livestock prefer to graze the easily accessible areas before they graze the steep slopes.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Provide periodic rest during spring in alternate years.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Beclabito**—

nonirrigated—6c; **Kinusta**—nonirrigated—7s;

Badland—nonirrigated—8s

Range site: **Beclabito**—Sandy Loam Upland (saline) 10-14" p.z.; **Kinusta**—Breaks 10-14" p.z.;

Badland—not assigned

400—Wetherill-Atlatl association, 1 to 15 percent slopes

Setting

Landform: Plateaus, mesas, and cuevas

Position on the landform: **Wetherill**—summits;

Atlatl—knolls, rims, and dipslopes

Slope: **Wetherill**—1 to 15 percent; **Atlatl**—1 to 15 percent

Shape of areas: Irregular

Size of areas: 500 to 1,000 acres

Elevation: 6,500 to 7,900 feet

Mean annual precipitation: 12 to 16 inches

Mean annual air temperature: 48 to 50 degrees F

Frost-free period: 130 to 150 days

Composition

Wetherill very fine sandy loam and similar soils: 50 percent

Atlatl gravelly fine sandy loam and similar soils: 35 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- Rock outcrop as exposures of sandstone bedrock occurring in small ledges
- The very shallow Vessilla soil on structural benches

Characteristics of the Wetherill Soil

Typical profile:

- 0 to 3 inches—brown very fine sandy loam
- 3 to 18 inches—reddish brown loam
- 18 to 42 inches—light reddish brown and strong brown clay loam and loam
- 42 to 70 inches—light brown and strong brown loam

Parent material: Eolian material derived from siltstone and sandstone

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: High to very high

Surface runoff: Medium

Hazard of water erosion: Very severe

Hazard of soil blowing: Moderate

Characteristics of the Atlatl Soil

Typical profile:

- 0 to 2 inches—brown gravelly fine sandy loam
- 2 to 17 inches—light brown fine sandy loam
- 17 to 30 inches—very pale brown and white loam
- 30 inches—sandstone bedrock

Parent material: Eolian material, alluvium, and residuum derived from sandstone and siltstone

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Low

Surface runoff: Medium

Hazard of water erosion: Moderate

Hazard of soil blowing: Moderate

Major Uses

Woodland production (fig. 10)

Livestock grazing

Woodland production

Wetherill soil

Dominant overstory vegetation:

Utah juniper (70%), pinyon (30%)

Average site index: 65

Overstory production (per acre):

fuelwood—7 to 8 cords in a stand of trees that averages 5 inches in diameter at a height of 1 foot; posts—15 to 25; Christmas trees—30 to 40; ornamental trees—30 to 40

Atlatl soil

Dominant overstory vegetation:

Utah juniper (60%), pinyon (40%)

Average site index: 53

Overstory production (per acre):

fuelwood—6 to 7 cords in a stand of trees that averages 5 inches in diameter at a height of 1 foot; posts—15 to 25; Christmas trees—30 to 40; ornamental trees—30 to 40

Major limitations:

Wetherill—hazard of water erosion, hazard of soil blowing, plant competition

Atlatl—hazard of water erosion, hazard of soil blowing, windthrow hazard, plant competition

Suitable management practices and concerns:

- Wood products can be harvested when canopy cover exceeds 30 percent.
- Maintaining the understory vegetation is essential in controlling erosion.
- Reduce the risk of water erosion and soil blowing by preventing excessive disturbance of the soils.
- Restrict the use of wheeled equipment to periods when the soils are dry or frozen to reduce compaction and subsequent water erosion.
- Reduce the problem of competition from unwanted plants by preventing the over-harvest of trees.

Atlatl soil

• Because roots are somewhat restricted by bedrock, trees have a moderate hazard of windthrow when the soil is excessively wet and winds are strong.

• To reduce the hazard of windthrow, avoid excessive cutting of trees, limit the width of maintained roads, and avoid making large openings in the canopy.

Livestock grazing

Wetherill soil

Dominant understory vegetation in potential plant community:

Wyoming big sagebrush, antelope bitterbrush, muttongrass, green Mormon tea, datil yucca, bottlebrush squirreltail

Annual production of air-dry vegetation (pounds per acre):

Favorable years—700

Unfavorable years—300

Present understory plant community:

Wyoming big sagebrush, bottlebrush squirreltail, cheatgrass, green Mormon tea, datil yucca

Atlatl soil

Dominant understory vegetation in potential plant community:

green Mormon tea, muttongrass, Indian ricegrass,



Figure 10.—The common overstory vegetation of twoneedle pinyon and Utah juniper within a woodland plant community. This canopy occurs on Atlatl gravelly fine sandy loam in an area of Wetherill-Atlatl association, 1 to 15 percent slopes, along the New Mexico-Colorado state line.

thrifty goldenweed, bottlebrush squirreltail,
southwest rabbitbrush, datil yucca, plains
pricklypear

*Annual production of air-dry vegetation (pounds per
acre):*

Favorable years—500

Unfavorable years—200

Present understory plant community:

green Mormon tea, southwest rabbitbrush, datil
yucca, plains pricklypear, thrifty goldenweed

Major limitations:

Wetherill—hazard of water erosion, hazard of soil
blowing

Atlatl—hazard of water erosion, hazard of soil
blowing, depth to bedrock, low available water
capacity

Suitable management practices and concerns:

- Where the density of the canopy is less than about

30 percent, the understory produces plants suitable
for grazing.

- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of water erosion and soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Wetherill soil

- This soil is unsuitable for mechanical range seeding because of tree density.
- The chaining or crushing of trees are not recommended practices.
- Where the trees have been removed by chaining,

the present plant community is dominated by crested wheatgrass, galleta, and Wyoming big sagebrush.

- To increase forage production, seed disturbed areas to suited grasses by broadcasting.
- Adequate site preparation is needed for successful seeding of understory plants.
- Seed late in the fall for best results.
- After seeding, defer grazing until the young plants are well established.

Atlatl soil

- The suitability for mechanical range seeding is poor because of tree density and soil factors.

Interpretive Groups

Land capability classification: **Wetherill**—

nonirrigated—6e; **Atlatl**—nonirrigated—4c

Range site: **Wetherill**—not assigned (pj woodland);

Atlatl—not assigned (pj woodland)

401—Vessilla-Rock outcrop complex, 5 to 25 percent slopes

Setting

Landform: Structural benches and cuestas

Position on the landform: **Vessilla**—summits and dipslopes; **Rock outcrop**—slickrock and small cliffs

Shape of areas: Irregular

Size of areas: 20 to 1,000 acres

Elevation: 6,500 to 7,800 feet

Mean annual precipitation: 12 to 16 inches

Mean annual air temperature: 48 to 50 degrees F

Frost-free period: 130 to 150 days

Composition

Vessilla channery fine sandy loam and similar soils: 65 percent

Rock outcrop: 25 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- The moderately deep Atlatl soil on knolls and rims

Characteristics of the Vessilla Soil

Typical profile:

- 0 to 3 inches—light brown channery fine sandy loam
- 3 to 8 inches—light brown fine sandy loam
- 8 inches—sandstone bedrock

Parent material: Alluvium and eolian material derived from sandstone

Depth class: Very shallow

Drainage class: Well drained

Permeability: Moderately rapid

Available water capacity: Very low

Surface runoff: Rapid

Hazard of water erosion: Severe

Hazard of soil blowing: Severe

Characteristics of Rock outcrop

Rock outcrop consists of exposures of sandstone bedrock. It occurs as gently to moderately sloping slickrock, small vertical cliffs, and some ledges intermingled with the Vessilla soil. There is little or no vegetation, and surface runoff is rapid.

Major Uses

Woodland production

Livestock grazing

Woodland production

Dominant overstory vegetation:

Utah juniper (55%), pinyon (45%)

Average site index: 80

Overstory production (per acre):

fuelwood—10 to 12 cords in a stand of trees that averages 5 inches in diameter at a height of 1 foot; posts—15 to 25; Christmas trees—35 to 45; ornamental trees—35 to 45

Major limitations: hazard of water erosion, hazard of soil blowing, equipment limitations, seedling mortality, windthrow hazard

Suitable management practices and concerns:

- Wood products can be harvested when canopy cover exceeds 30 percent.
- The use of wheeled equipment in harvesting wood products on this soil is moderately restricted in most places because of the presence of slopes over 15 percent and numerous rock outcrops.
- Maintaining the understory vegetation is essential in controlling erosion.
- Reduce the risk of water erosion and soil blowing by preventing excessive disturbance of the cryptogamic crusts growing on this soil.
- Tree seedlings have a moderately low rate of survival because of high summer temperatures and the very low water holding capacity of the soil.
- Reduce the problem of seedling mortality by leaving some of the larger trees to provide shade for seedling trees.

- Because roots are restricted by bedrock, trees have a severe hazard of windthrow when the soil is excessively wet and winds are strong.
- To reduce the hazard of windthrow, avoid excessive cutting of trees, limit the width of maintained roads, and avoid making large openings in the canopy.

Livestock grazing

Dominant understory vegetation in potential plant community:

Indian ricegrass, muttongrass, green Mormon tea, thrifty goldenweed, Wyoming big sagebrush, Greene rabbitbrush, datil yucca, broom snakeweed, bottlebrush squirreltail

Annual production of air-dry vegetation (pounds per acre):

Favorable years—500

Unfavorable years—200

Present understory plant community:

green Mormon tea, thrifty goldenweed, Greene rabbitbrush, broom snakeweed, datil yucca

Major limitations: hazard of water erosion, hazard of soil blowing, depth to bedrock, presence of rock outcrops

Suitable management practices and concerns:

- Where the density of the canopy is less than about 30 percent, the understory produces plants suitable for grazing.
- Uniform distribution of grazing is difficult because of the slope, or the lack of permanent water developments, or both.
- Livestock prefer to graze the easily accessible areas before they graze the steep slopes.
- Promote uniform grazing by fencing, properly locating salt licks, and proper stocking.
- Vary the season of grazing and the periods of rest during successive years.
- Control the time and amount of use by livestock.
- Reduce the risk of water erosion and soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.
- The suitability for mechanical range seeding is poor because of soil factors and tree density.

Interpretive Groups

Land capability classification: Vessilla—

nonirrigated—7s; **Rock outcrop**—nonirrigated—8s

Range site: Vessilla—not assigned (pj woodland);

Rock outcrop—not assigned

402—Chazner very cobbly very fine sandy loam, 5 to 15 percent slopes, extremely stony

Setting

Landform: Fan terraces

Position on the landform: Treads

Shape of areas: Irregular

Size of areas: 500 to 2,000 acres

Elevation: 6,200 to 7,200 feet

Mean annual precipitation: 12 to 14 inches

Mean annual air temperature: 48 to 50 degrees F

Frost-free period: 130 to 150 days

Composition

Chazner soil and similar soils: 90 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- The very cobbly, moderately coarse textured Katzine soil on risers of fan terraces
- The very deep Tsezhin soil on treads of fan terraces

Typical Profile

- 0 to 2 inches—reddish brown very cobbly very fine sandy loam
- 2 to 6 inches—reddish brown gravelly very fine sandy loam
- 6 to 18 inches—reddish brown and light brown gravelly sandy clay loam
- 18 to 29 inches—white very cobbly coarse sandy loam
- 29 inches—indurated calcium carbonate pan

Soil Properties and Qualities

Parent material: Alluvium derived from quartz diorite and sandstone

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Very low

Surface runoff: Medium

Hazard of water erosion: Moderate

Hazard of soil blowing: Moderate

Major Uses

Woodland production

Livestock grazing

Woodland production*Dominant overstory vegetation:*

Utah juniper (60%), pinyon (40%)

Average site index: 65

Overstory production (per acre):

fuelwood—8 to 9 cords in a stand of trees that averages 5 inches in diameter at a height of 1 foot; posts—25 to 35; Christmas trees—190 to 210; ornamental trees—190 to 210

Major limitations: hazard of water erosion, hazard of soil blowing, seedling mortality, windthrow hazard, plant competition

Suitable management practices and concerns:

- Wood products can be harvested when canopy cover exceeds 25 percent.
- Maintaining the understory vegetation is essential in controlling erosion.
- Reduce the risk of water erosion and soil blowing by preventing excessive disturbance of the soil.
- Restrict the use of wheeled equipment to periods when the soil is dry or frozen to reduce compaction and subsequent erosion.
- Tree seedlings have a moderately low rate of survival because of high summer temperatures and the very low water holding capacity of the soil.
- Reduce the problem of seedling mortality by leaving some of the larger trees to provide shade for seedling trees.
- Because roots are somewhat restricted by an indurated pan, trees have a moderate hazard of windthrow when the soil is excessively wet and winds are strong.
- To reduce the hazard of windthrow, avoid excessive cutting of trees, limit the width of maintained roads, and avoid making large openings in the canopy.
- Reduce the problem of competition from unwanted plants by preventing the over-harvest of trees.

Livestock grazing*Dominant understory vegetation in potential plant community:*

black sagebrush, Wyoming big sagebrush, muttongrass, bottlebrush squirreltail, blue grama, green Mormon tea, datil (banana) yucca

Annual production of air-dry vegetation (pounds per acre):

Favorable years—600

Unfavorable years—200

Present understory plant community:

black sagebrush, Wyoming big sagebrush, muttongrass, bottlebrush squirreltail, galleta, datil yucca, green Mormon tea

Major limitations: hazard of soil blowing, depth to

cemented pan, surface rock fragments, very low water holding capacity

Suitable management practices and concerns:

- Where the density of the canopy is less than about 30 percent, the understory produces plants suitable for grazing.
- Vary the season of grazing and the periods of rest during successive years.
- Control the time and amount of use by livestock.
- Promote uniform grazing by fencing, properly locating salt licks, and proper stocking.
- Reduce the risk of soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.
- Suitability for mechanical range seeding is poor because of soil factors and tree density.

Interpretive Groups

Land capability classification: Nonirrigated—4s

Range site: Not assigned (pj woodland)

403—Chazner-Katzine complex, 5 to 45 percent slopes**Setting**

Landform: Dissected fan terraces

Position on the landform: **Chazner**—treads;

Katzine—risers

Slope: **Chazner**—5 to 10 percent; **Katzine**—15 to 45 percent

Shape of areas: Irregular

Size of areas: 50 to 2,000 acres

Elevation: 6,200 to 7,000 feet

Mean annual precipitation: 12 to 14 inches

Mean annual air temperature: 48 to 50 degrees F

Frost-free period: 130 to 150 days

Composition

Chazner very gravelly fine sandy loam, stony and similar soils: 45 percent

Katzine very cobbly very fine sandy loam, extremely stony and similar soils: 40 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- Rock outcrop as exposures of sandstone bedrock in small ledges and slickrock on risers of fan terraces
- The very shallow Nizhoni soil on small structural benches
- The very deep, very cobbly Tsezhin soil on treads of fan terraces

Characteristics of the Chazner Soil

Typical profile:

- 0 to 2 inches—reddish brown very gravelly fine sandy loam
- 2 to 6 inches—reddish brown gravelly fine sandy loam
- 6 to 16 inches—brown and light brown gravelly sandy clay loam
- 16 to 25 inches—pinkish white very cobbly sandy loam
- 25 inches—indurated calcium carbonate pan

Parent material: Alluvium derived from quartz diorite and sandstone

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Very low

Surface runoff: Medium

Hazard of water erosion: Moderate

Hazard of soil blowing: Moderate

Characteristics of the Katzine Soil

Typical profile:

- 0 to 7 inches—reddish brown very cobbly very fine sandy loam
- 7 to 47 inches—light brown and reddish yellow very cobbly fine sandy loam
- 47 to 63 inches—light brown extremely cobbly loamy sand

Parent material: Alluvium derived from quartz diorite and sandstone

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately rapid

Available water capacity: Very low to low

Surface runoff: Rapid

Hazard of water erosion: Very severe

Hazard of soil blowing: Slight

Major Uses

Woodland production

Livestock grazing

Woodland production

Chazner soil

Dominant overstory vegetation:

Utah juniper (60%), pinyon (40%)

Average site index: 65

Overstory production (per acre):

fuelwood—7 to 8 cords in a stand of trees that averages 5 inches in diameter at a height of 1 foot; posts—15 to 25; Christmas trees—130 to 150; ornamental trees—130 to 150

Katzine soil

Dominant overstory vegetation:

Utah juniper (70%), pinyon (30%)

Average site index: 60

Overstory production (per acre):

fuelwood—7 to 8 cords in a stand of trees that averages 5 inches in diameter at a height of 1 foot; posts—5 to 15; Christmas trees—65 to 75; ornamental trees—65 to 75

Major limitations:

Chazner—hazard of water erosion, hazard of soil blowing, seedling mortality, windthrow hazard, plant competition

Katzine—hazard of water erosion, equipment limitations, seedling mortality, plant competition

Suitable management practices and concerns:

- Wood products can be harvested when the canopy cover exceeds 25 percent.
- Maintaining the understory vegetation is essential in controlling erosion.
- Reduce the risk of water erosion and soil blowing by preventing excessive disturbance of the soils and harvesting trees growing on very steep slopes.
- Restrict the use of wheeled equipment to periods when the soils are dry or frozen to reduce compaction and subsequent water erosion.
- Tree seedlings have a low rate of survival because of high summer temperatures and the very low water holding capacity of the soils.
- Reduce the problem of seedling mortality by leaving some of the larger trees to provide shade for seedling trees.
- Reduce the problem of competition from unwanted plants by preventing the over-harvest of trees.

Chazner soil

• Because roots are somewhat restricted by an indurated pan, trees have a moderate hazard of windthrow when the soil is excessively wet and winds are strong.

• To reduce the hazard of windthrow, avoid excessive cutting of trees, limit the width of maintained roads, and avoid making large openings in the canopy.

Katzine soil

• The use of wheeled equipment in harvesting wood products on this soil is moderately restricted in most places because of the presence of slopes over 15 percent.

Livestock grazing

Chazner soil

Dominant understory vegetation in potential plant community:

Wyoming big sagebrush, black sagebrush,

muttongrass, bottlebrush squirreltail, blue grama, green Mormon tea, datil (banana) yucca

Annual production of air-dry vegetation (pounds per acre):

Favorable years—600

Unfavorable years—200

Present understory plant community:

Wyoming big sagebrush, black sagebrush, muttongrass, bottlebrush squirreltail, blue grama, green Mormon tea, datil yucca, broom snakeweed

Katzine soil

Dominant understory vegetation in potential plant community:

black sagebrush, Indian ricegrass, muttongrass, Wyoming big sagebrush, blue grama, galleta, green Mormon tea, Stansbury cliffrose

Annual production of air-dry vegetation (pounds per acre):

Favorable years—600

Unfavorable years—200

Present understory plant community:

black sagebrush, Indian ricegrass, muttongrass, galleta, blue grama, green Mormon tea, Stansbury cliffrose

Major limitations:

Chazner—hazard of water erosion, hazard of soil blowing, depth to cemented pan, subsurface rock fragments

Katzine—hazard of water erosion, surface and subsurface rock fragments, steep slopes

Suitable management practices and concerns:

- Where the density of the canopy is less than about 30 percent, the understory produces plants suitable for grazing.
- Uniform distribution of grazing is difficult because of the slope, or the lack of permanent water developments, or both.
- Livestock prefer to graze the easily accessible areas before they graze the steep slopes.
- Promote uniform grazing by fencing, properly locating salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Vary the season of grazing and the periods of rest during successive years.
- Reduce the risk of water erosion and soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.
- The suitability for mechanical range seeding is poor because of soil factors and tree density.

Interpretive Groups

Land capability classification: **Chazner**—

nonirrigated—4s; **Katzine**—nonirrigated—7e

Range site: **Chazner**—not assigned (pj woodland);

Katzine—not assigned (pj woodland)

404—Wetherill-Tsezhin association, 3 to 15 percent slopes

Setting

Landform: Fan terraces

Position on the landform: **Wetherill**—lower treads;

Tsezhin—upper treads

Slope: **Wetherill**—3 to 8 percent; **Tsezhin**—5 to 15 percent

Shape of areas: Irregular

Size of areas: 100 to 3,000 acres

Elevation: 6,200 to 7,400 feet

Mean annual precipitation: 12 to 14 inches

Mean annual air temperature: 48 to 50 degrees F

Frost-free period: 130 to 150 days

Composition

Wetherill very fine sandy loam and similar soils: 55 percent

Tsezhin very cobbly very fine sandy loam, extremely stony and similar soils: 30 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The moderately deep Chazner soil on treads of fan terraces
- The very cobbly, moderately coarse textured Katzine soil on risers of fan terraces

Characteristics of the Wetherill Soil

Typical profile:

- 0 to 4 inches—reddish brown very fine sandy loam
- 4 to 19 inches—reddish brown loam
- 19 to 65 inches—reddish brown and yellowish red loam and sandy clay loam

Parent material: Eolian material derived from siltstone and sandstone

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: High to very high

Surface runoff: Medium

Hazard of water erosion: Severe

Hazard of soil blowing: Moderate

Characteristics of the Tsezhin Soil

Typical profile:

- 0 to 2 inches—reddish brown very cobbly very fine sandy loam
- 2 to 35 inches—yellowish red very gravelly clay loam
- 35 to 51 inches—yellowish red with pinkish white very cobbly clay loam
- 51 to 65 inches—yellowish red very cobbly clay loam

Parent material: Alluvium derived from sandstone, shale, and quartz diorite

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately slow

Available water capacity: Low to moderate

Surface runoff: Medium

Hazard of water erosion: Moderate

Hazard of soil blowing: Slight

Major Uses

Woodland production

Livestock grazing

Woodland production

Wetherill soil

Dominant overstory vegetation:

Utah juniper (70%), pinyon (30%)

Average site index: 65

Overstory production (per acre):

fuelwood—8 to 10 cords in a stand of trees that averages 5 inches in diameter at a height of 1 foot; posts—15 to 25; Christmas trees—30 to 40; ornamental trees—30 to 40

Tsezhin soil

Dominant overstory vegetation:

pinyon (50%), Utah juniper (50%)

Average site index: 70

Overstory production (per acre):

fuelwood—8 to 10 cords in a stand of trees that averages 5 inches in diameter at a height of 1 foot; posts—75 to 85; Christmas trees—130 to 150; ornamental trees—130 to 150

Major limitations:

Wetherill—hazard of water erosion, hazard of soil blowing, plant competition

Tsezhin—seedling mortality, plant competition

Suitable management practices and concerns:

- Wood products can be harvested when the canopy cover exceeds 25 percent.

- Maintaining the understory vegetation is essential in controlling erosion.

- Reduce the risk of water erosion and soil blowing by preventing excessive disturbance of the soils.

- Restrict the use of wheeled equipment to periods when the soils are dry or frozen to reduce compaction and subsequent water erosion.

- Reduce the problem of competition from unwanted plants by preventing the over-harvest of trees.

Tsezhin soil

- Tree seedlings have a moderate rate of survival because of high summer temperatures and the moderate water holding capacity of the soil.

- Reduce the problem of seedling mortality by leaving some of the larger trees to provide shade for seedling trees.

Livestock grazing

Wetherill soil

Dominant understory vegetation in present plant community:

Wyoming big sagebrush, antelope bitterbrush, muttongrass, green Mormon tea, datil yucca, bottlebrush squirreltail

Annual production of air-dry vegetation (pounds per acre):

Favorable years—700

Unfavorable years—300

Present understory plant community:

Wyoming big sagebrush, antelope bitterbrush, green Mormon tea, datil yucca, bottlebrush squirreltail

Tsezhin soil

Dominant understory vegetation in potential plant community:

black sagebrush, muttongrass, bottlebrush squirreltail, blue grama, Wyoming big sagebrush, datil (banana) yucca, Stansbury cliffrose, toadflax penstemon

Annual production of air-dry vegetation (pounds per acre):

Favorable years—600

Unfavorable years—200

Present understory plant community:

black sagebrush, Wyoming big sagebrush, datil yucca, Stansbury cliffrose, muttongrass, bottlebrush squirreltail, blue grama, toadflax penstemon

Major limitations:

Wetherill—hazard of water erosion, hazard of soil blowing

Tsezhin—surface and subsurface rock fragments

Suitable management practices and concerns:

- Where the density of the canopy is less than about 30 percent, the understory produces plants suitable for grazing.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of water erosion and soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.
- The suitability for mechanical range seeding is poor because of tree density and/or soil factors.
- The chaining or crushing of trees are not recommended practices.
- Where the trees have been removed by chaining the present plant community is dominated by crested wheatgrass, galleta, and Wyoming big sagebrush.
- To increase forage production, seed disturbed areas to suited grasses by broadcasting.
- Adequate site preparation is needed for successful seeding of understory plants.
- Seed late in the fall for best results.
- After seeding, defer grazing until the young plants are well established.

Interpretive Groups

Land capability classification: **Wetherill**—nonirrigated—6e; **Tsezhin**—nonirrigated—6s
Range site: **Wetherill**—not assigned (pj woodland);
Tsezhin—not assigned (pj woodland)

406—Rock outcrop-Nizhoni complex, 2 to 20 percent slopes

Setting

Landform: Cuestas and structural benches (fig. 11)
Position on the landform: **Rock outcrop**—slickrock and cliffs; **Nizhoni**—dipslopes and summits
Shape of areas: Irregular
Size of areas: 500 to 10,000 acres
Elevation: 6,200 to 7,600 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 120 to 140 days

Composition

Rock outcrop: 50 percent
 Nizhoni very fine sandy loam and similar soils: 35 percent
 Contrasting inclusions: 15 percent

Contrasting Inclusions

- The shallow Sojourn soil on footslopes and backslopes
- The very deep Wetherill soil on summits with thick eolian deposits
- Very deep, coarse textured soils on stable dunes
- Riverwash in washes
- The very deep Katzine soil on risers of fan terraces

Characteristics of Rock outcrop

Rock outcrop consists of exposures of sandstone bedrock. It occurs as gently to moderately sloping slickrock intermixed with the Nizhoni soil, and as steeply sloping to vertical cliffs and spires. There is little or no vegetation, and surface runoff is rapid to very rapid.

Characteristics of the Nizhoni Soil

Typical profile:

- 0 to 3 inches—yellowish red very fine sandy loam
- 3 to 7 inches—red and dark reddish gray fine sandy loam
- 7 inches—sandstone bedrock

Parent material: Eolian material and residuum derived from sandstone

Depth class: Very shallow

Drainage class: Well drained

Permeability: Moderately rapid

Available water capacity: Very low

Surface runoff: Rapid

Hazard of water erosion: Very severe

Hazard of soil blowing: Severe

Major Uses

Woodland production
 Livestock grazing

Woodland production

Dominant overstory vegetation:

pinyon (60%), Utah juniper (40%)

Average site index: 43

Overstory production (per acre):

fuelwood—5 to 6 cords in a stand of trees that averages 5 inches in diameter at a height of 1 foot; posts—5 to 15; Christmas trees—35 to 45; ornamental trees—35 to 45

Major limitations: hazard of water erosion, hazard of soil blowing, equipment limitations, seedling mortality, windthrow hazard

Suitable management practices and concerns:

- Wood products can be harvested when the canopy cover exceeds 30 percent.
- The use of wheeled equipment in harvesting wood

products on this soil is severely restricted in most places because of the presence of slopes over 15 percent and numerous rock outcrops.

- Maintaining the understory vegetation is essential in controlling erosion.
- Reduce the risk of water erosion and soil blowing by preventing excessive disturbance of the cryptogamic crusts growing on this soil.
- Tree seedlings have a moderately low rate of survival because of high summer temperatures and the very low water holding capacity of the soil.
- Reduce the problem of seedling mortality by leaving some of the larger trees to provide shade for seedling trees.
- Because roots are restricted by bedrock, trees have a severe hazard of windthrow when the soil is excessively wet and winds are strong.

- To reduce the hazard of windthrow, avoid excessive cutting of trees, limit the width of maintained roads, and avoid making large openings in the canopy.

Livestock grazing

Dominant understory vegetation in potential plant community:

muttongrass, true mountainmahogany, littleleaf mountainmahogany, Wyoming big sagebrush, Indian ricegrass, blue grama, Utah snowberry, Stansbury cliffrose, green Mormon tea, singleleaf ash

Annual production of air-dry vegetation (pounds per acre):

Favorable years—500

Unfavorable years—200

Present understory plant community:



Figure 11.—An area of Rock outcrop-Nizhoni complex, 2 to 20 percent slopes, northeast of Cove Mesa in Arizona. Rock outcrop of sandstone is present on the fins of slickrock which dominate this area. Nizhoni very fine sandy loam is present on structural benches under pinyon-juniper woodland.

muttongrass, Indian ricegrass, blue grama, Wyoming big sagebrush, Utah snowberry, true mountainmahogany, Stansbury cliffrose, green Mormon tea

Major limitations: hazard of water erosion, hazard of soil blowing, depth to bedrock, presence of rock outcrops

Suitable management practices and concerns:

- Where the density of the canopy is less than about 25 percent, the understory produces plants suitable for grazing.
- Uniform distribution of grazing is difficult because of the slope, or the lack of permanent water developments, or both.
- Livestock prefer to graze the easily accessible areas before they graze the steep slopes.
- Promote uniform grazing by fencing, properly locating salt licks, and proper stocking.
- Vary the season of grazing and the periods of rest during successive years.
- Control the time and amount of use by livestock.
- Reduce the risk of water erosion and soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.
- The suitability for mechanical range seeding is poor because of soil factors and tree density.

Interpretive Groups

Land capability classification: **Rock outcrop**—nonirrigated—8s; **Nizhoni**—nonirrigated—7s

Range site: **Rock outcrop**—not assigned (pj woodland); **Nizhoni**—not assigned (pj woodland)

407—Iwela-Nomrah-Vosburg complex, 1 to 40 percent slopes

Setting

Landform: Broad, stable landslides

Position on the landform: **Iwela**—footslopes and backslopes; **Nomrah**—footslopes; **Vosburg**—toeslopes

Slope: **Iwela**—10 to 40 percent; **Nomrah**—2 to 10 percent; **Vosburg**—1 to 5 percent

Shape of areas: Irregular

Size of areas: 200 to 5,000 acres

Elevation: 6,800 to 7,800 feet

Mean annual precipitation: 12 to 16 inches

Mean annual air temperature: 48 to 50 degrees F

Frost-free period: 120 to 140 days

Composition

Iwela very cobbly fine sandy loam, extremely bouldery and similar soils: 40 percent

Nomrah fine sandy loam and similar soils: 35 percent

Vosburg loam and similar soils: 15 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- Deep, clayey, sodic soils on footslopes and toeslopes
- Badland of shale bedrock on backslopes

Characteristics of the Iwela Soil

Typical profile:

- 0 to 3 inches—dark brown very cobbly fine sandy loam
- 3 to 9 inches—reddish brown gravelly sandy clay loam
- 9 to 26 inches—brown and light brown cobbly sandy clay loam
- 26 to 44 inches—very pale brown very stony sandy loam
- 44 to 64 inches—very pale brown very stony loamy sand

Parent material: Colluvium derived from sandstone and shale

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate in the upper part and rapid below a depth of 44 inches

Available water capacity: Low to moderate

Surface runoff: Medium

Hazard of water erosion: Severe

Hazard of soil blowing: Slight

Characteristics of the Nomrah Soil

Typical profile:

- 0 to 3 inches—dark brown fine sandy loam
- 3 to 32 inches—brown and yellowish red sandy clay loam
- 32 to 58 inches—light reddish brown sandy clay loam
- 58 to 62 inches—strong brown fine sandy loam

Parent material: Eolian material and alluvium derived from sandstone

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: High

Surface runoff: Slow

Hazard of water erosion: Moderate

Hazard of soil blowing: Moderate

Characteristics of the Vosburg Soil

Typical profile:

- 0 to 7 inches—dark brown loam
- 7 to 36 inches—dark brown clay loam
- 36 to 65 inches—brown sandy clay loam

Parent material: Alluvium derived from sandstone and shale

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: High to very high

Surface runoff: Medium

Hazard of water erosion: Moderate

Hazard of soil blowing: Slight

Major Uses

Woodland production

Livestock grazing

Woodland production

Iwela soil

Dominant overstory vegetation:

pinyon (60%), Utah juniper (40%)

Average site index: 55

Overstory production (per acre):

fuelwood—6 to 7 cords in a stand of trees that averages 5 inches in diameter at a height of 1 foot; posts—5 to 15; Christmas trees—20 to 30; ornamental trees—15 to 25

Nomrah soil

Dominant overstory vegetation:

pinyon (75%), Utah juniper (25%)

Average site index: 70

Overstory production (per acre):

fuelwood—9 to 11 cords in a stand of trees that averages 5 inches in diameter at a height of 1 foot; posts—5 to 15; Christmas trees—20 to 30; ornamental trees—20 to 30

Major limitations:

Iwela—hazard of water erosion, equipment limitations, seedling mortality, plant competition

Nomrah—hazard of soil blowing, plant competition

Suitable management practices and concerns:

- Wood products can be harvested when the canopy cover exceeds 35 percent.
- Maintaining the understory vegetation is essential in controlling erosion.
- Reduce the risk of water erosion and soil blowing by preventing excessive disturbance of the soils and harvesting trees growing on steep slopes.
- Restrict the use of wheeled equipment to periods

when the soils are dry or frozen to reduce compaction and subsequent water erosion.

- Reduce the problem of competition from unwanted plants by preventing the over-harvest of trees.

Iwela soil

• The use of wheeled equipment in harvesting wood products on this soil is severely restricted in most places because of the presence of slopes over 35 percent and numerous stones and boulders on the soil surface.

- Tree seedlings have a moderately low rate of survival because of high summer temperatures and the low water holding capacity of the soil.
- Reduce the problem of seedling mortality by leaving some of the larger trees to provide shade for seedling trees.

Livestock grazing

Iwela soil

Dominant understory vegetation in potential plant community:

Wyoming big sagebrush, black sagebrush, muttongrass, blue grama, bottlebrush squirreltail, galleta, earth sedge, thrifty goldenweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—650

Unfavorable years—350

Present understory plant community:

Wyoming big sagebrush, black sagebrush, blue grama, muttongrass, bottlebrush squirreltail, thrifty goldenweed

Nomrah soil

Dominant understory vegetation in potential plant community:

Wyoming big sagebrush, muttongrass, black sagebrush, blue grama, bottlebrush squirreltail, galleta

Annual production of air-dry vegetation (pounds per acre):

Favorable years—700

Unfavorable years—300

Present understory plant community:

Wyoming big sagebrush, black sagebrush, broom snakeweed, muttongrass, blue grama, bottlebrush squirreltail

Vosburg soil

Dominant vegetation in potential plant community:

western wheatgrass, bottlebrush squirreltail, Wyoming big sagebrush, blue grama, galleta, Indian ricegrass, broom snakeweed, threadleaf rubber rabbitbrush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—1,200

Unfavorable years—500

Present plant community:

Wyoming big sagebrush, blue grama, western wheatgrass, bottlebrush squirreltail, broom snakeweed, threadleaf rubber rabbitbrush

Major limitations:

Iwela—hazard of water erosion, surface and subsurface rock fragments, steep slopes

Nomrah—hazard of soil blowing

Vosburg—hazard of water erosion

Suitable management practices and concerns:

- Where the density of the canopy is less than about 30 percent, the understory produces plants suitable for grazing.
- Uniform distribution of grazing is difficult on the Iwela soil because of the slope, or the lack of permanent water developments, or both.
- Livestock prefer to graze the easily accessible areas before they graze the steep slopes.
- Promote uniform grazing by fencing, properly locating salt licks, and proper stocking.
- Vary the season of grazing and the periods of rest during successive years.
- Control the time and amount of use by livestock.
- Reduce the risk of water erosion and soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.
- To increase forage production, seed disturbed areas to suited grasses by drilling.
- Adequate site preparation is needed for successful seeding of understory plants.
- Seed late in the fall for best results.
- After seeding, defer grazing until the young plants are well established.

Iwela and Nomrah soils

- The suitability for mechanical range seeding is poor because of tree density and/or soil factors.
- The chaining or crushing of trees are not recommended practices.

Vosburg soil

- Range seeding may be needed if the better forage plants have decreased.
- The suitability for mechanical range seeding is good.
- If shrubs are managed to create open areas, a good stand of desirable grasses and forbs can be produced.
- Manage the brush in areas where unpalatable brushy plants have increased significantly. Control

the brush by mechanical means or prescribed burning.

- Seed the range if the plant cover is not sufficient to protect the soil from erosion.
- Seed late in the fall for best results.
- After seeding, defer grazing until the young plants are well established.

Interpretive Groups

Land capability classification: **Iwela**—nonirrigated—6s; **Nomrah**—nonirrigated—4c; **Vosberg**—nonirrigated—4c

Range site: **Iwela**—not assigned (pj woodland); **Nomrah**—not assigned (pj woodland); **Vosberg**—Loamy Upland 12-16" p.z.

408—Nizhoni-Rock outcrop complex, 2 to 15 percent slopes

Setting

Landform: Mesas

Position on the landform: **Nizhoni**—summits; **Rock outcrop**—slickrock

Shape of areas: Irregular

Size of areas: 20 to 1,000 acres

Elevation: 6,300 to 7,600 feet

Mean annual precipitation: 12 to 16 inches

Mean annual air temperature: 48 to 50 degrees F

Frost-free period: 120 to 140 days

Composition

Nizhoni very fine sandy loam and similar soils: 70 percent

Rock outcrop: 20 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- The very deep Wetherill soil on eolian-mantled areas of summits
- Very deep, coarse textured soils on stable dunes
- Moderately coarse textured soils which are moderately deep to bedrock on summits.

Characteristics of the Nizhoni Soil

Typical profile:

- 0 to 3 inches—reddish brown very fine sandy loam
- 3 to 9 inches—reddish brown very fine sandy loam and fine sandy loam
- 9 inches—sandstone bedrock

Parent material: Eolian material and residuum derived from sandstone

Depth class: Very shallow

Drainage class: Well drained

Permeability: Moderately rapid

Available water capacity: Very low

Surface runoff: Rapid

Hazard of water erosion: Very severe

Hazard of soil blowing: Severe

Characteristics of Rock outcrop

Rock outcrop consists of exposures of sandstone bedrock. It occurs as gently sloping slickrock, or as small irregular cliffs and ledges which are intermingled with the Nizhoni soil. There is little or no vegetation, and surface runoff is rapid.

Major Uses

Woodland production

Livestock grazing

Woodland production

Dominant overstory vegetation:

pinyon (60%), Utah juniper (40%)

Average site index: 65

Overstory production (per acre):

fuelwood—8 to 10 cords in a stand of trees that averages 5 inches in diameter at a height of 1 foot; posts—10 to 20; Christmas trees—5 to 15; ornamental trees—5 to 15

Major limitations: hazard of water erosion, hazard of soil blowing, equipment limitations, seedling mortality, windthrow hazard

Suitable management practices and concerns:

- Wood products can be harvested when the canopy cover exceeds 35 percent.
- The use of wheeled equipment in harvesting wood products on this soil is moderately restricted in most places because of the presence of numerous rock outcrops.
- Maintaining the understory vegetation is essential in controlling erosion.
- Reduce the risk of water erosion and soil blowing by preventing excessive disturbance of the cryptogamic crusts growing on this soil.
- Tree seedlings have a moderately low rate of survival because of high summer temperatures and the very low water holding capacity of the soil.
- Reduce the problem of seedling mortality by leaving some of the larger trees to provide shade for seedling trees.
- Because roots are restricted by bedrock, trees have a severe hazard of windthrow when the soil is excessively wet and winds are strong.
- To reduce the hazard of windthrow, avoid excessive

cutting of trees, limit the width of maintained roads, and avoid making large openings in the canopy.

Livestock grazing

Dominant understory vegetation in potential plant community:

Stansbury cliffrose, Wyoming big sagebrush, muttongrass, blue grama, green Mormon tea, broom snakeweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—500

Unfavorable years—200

Present understory plant community:

muttongrass, blue grama, Wyoming big sagebrush, Stansbury cliffrose, green Mormon tea, broom snakeweed

Major limitations: hazard of water erosion, hazard of soil blowing, depth to bedrock, presence of rock outcrops

Suitable management practices and concerns:

- Where the density of the canopy is less than about 30 percent, the understory produces plants suitable for grazing.
- Promote uniform grazing by fencing, properly locating salt licks, and proper stocking.
- Vary the season of grazing and the periods of rest during successive years.
- Control the time and amount of use by livestock.
- Reduce the risk of water erosion and soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.
- The suitability for mechanical range seeding is poor because of soil factors and tree density.

Interpretive Groups

Land capability classification: **Nizhoni**—

nonirrigated—7s; **Rock outcrop**—nonirrigated—8s

Range site: **Nizhoni**—not assigned (pj woodland);

Rock outcrop—not assigned

409—Chinlini loam, 2 to 6 percent slopes

Setting

Landform: Treads of fan terraces and summits of mesas

Shape of areas: Elongate

Size of areas: 500 to 1,000 acres

Elevation: 6,300 to 6,700 feet

Mean annual precipitation: 12 to 14 inches

Mean annual air temperature: 50 to 52 degrees F

Frost-free period: 130 to 150 days

Composition

Chinlini soil and similar soils: 85 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The moderately deep Chazner soil on treads of fan terraces
- The very cobbly Katzine soil on risers of fan terraces

Typical Profile

- 0 to 3 inches—reddish brown loam
- 3 to 26 inches—yellowish red loam
- 26 to 38 inches—reddish brown sandy clay loam
- 38 to 50 inches—white very gravelly coarse sandy loam
- 50 inches—indurated calcium carbonate pan

Soil Properties and Qualities

Parent material: Eolian material derived from siltstone and sandstone, and alluvium derived from quartz diorite

Depth class: Deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Moderate to high

Water intake rate: Moderately slow

Surface runoff: Medium

Hazard of water erosion: Severe

Hazard of soil blowing: Moderate

Major Uses

Livestock grazing

Irrigated cropland and pasture

Livestock grazing

Dominant vegetation in potential plant community:

western wheatgrass, Wyoming big sagebrush, muttongrass, Indian ricegrass, bottlebrush squirreltail, blue grama, needleandthread

Annual production of air-dry vegetation (pounds per acre):

Favorable years—1,200

Unfavorable years—500

Present plant community:

Wyoming big sagebrush, bottlebrush squirreltail, broom snakeweed, cheatgrass

Major limitations: hazard of water erosion, hazard of soil blowing

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Provide periodic rest during spring in alternate years.
- Reduce the risk of water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.
- Range seeding may be needed if the better forage plants have decreased.
- The suitability for mechanical range seeding is good.
- Manage the brush in areas where unpalatable brushy plants have increased significantly. Control the brush by mechanical means or prescribed burning.
- Seed the range if the plant cover is not sufficient to protect the soil from erosion.
- Seed late in the fall for best results.
- After seeding, defer grazing until the young plants are well established.

Irrigated cropland and pasture

Suitable crops: alfalfa, corn, grasses and legumes for pasture

Major limitations: lack of dependable irrigation water, hazard of water erosion, hazard of soil blowing

Suitable management practices and concerns:

- Suitable irrigation systems are furrow, border, and corrugation.
- Land leveling is needed for uniform application of water with furrow, border, and corrugation methods.
- Use pipes, ditch linings, or drop structures in irrigation ditches to facilitate irrigation and reduce the risk of ditch erosion.
- Irrigate at a rate that insures optimum production but does not increase deep percolation, runoff, and erosion.
- All crops but legumes respond to nitrogen. Legumes respond to phosphorus.
- A plowpan forms if the soil is excessively cultivated.
- Maintain tilth by returning crop residue to the soil, using legume mixtures, and using conservation tillage methods.
- Grazing when the soil is dry reduces compaction of the surface layer, maintains tilth, and prevents excessive runoff.

- Reduce the risk of soil blowing by planting field windbreaks and maintaining a plant cover.
- Maintain the quality and quantity of forage by rotating grazing, mowing and clipping, controlling weeds, and fertilizing.

Windbreaks and environmental plantings

- Windbreaks are needed to limit soil losses, maintain optimum crop yields, protect farm and ranch buildings, and provide cover for wildlife.
- The trees and shrubs selected for planting should be suited to the conditions of the site.
- Irrigation should be provided for the establishment and maintenance of windbreaks.

Interpretive Groups

Land capability classification: Nonirrigated—4c
Range site: Loamy Upland 12-16" p.z.

410—Wetherill very fine sandy loam, 15 to 60 percent slopes, eroded

Setting

Landform: Dissected, eolian-mantled fan terraces
Shape of areas: Irregular
Size of areas: 20 to 1,000 acres
Elevation: 6,200 to 7,500 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 120 to 150 days

Composition

Wetherill soil and similar soils: 90 percent
 Contrasting inclusions: 10 percent

Contrasting Inclusions

- The very cobbly Katzine soil on risers of fan terraces
- Riverwash in wash channels

Typical Profile

- 0 to 3 inches—reddish brown very fine sandy loam
- 3 to 20 inches—reddish brown sandy clay loam
- 20 to 45 inches—yellowish red very fine sandy loam
- 45 to 66 inches—reddish yellow and strong brown fine sandy loam

Soil Properties and Qualities

Parent material: Eolian material derived from siltstone and sandstone
Depth class: Very deep
Drainage class: Well drained

Permeability: Moderate

Available water capacity: High

Surface runoff: Rapid

Hazard of water erosion: Very severe

Hazard of soil blowing: Moderate

Major Uses

Woodland production
 Livestock grazing

Woodland production

Dominant overstory vegetation:

Utah juniper (60%), pinyon (40%)

Average site index: 80

Overstory production (per acre):

fuelwood—10 to 12 cords in a stand of trees that averages 5 inches in diameter at a height of 1 foot; posts—15 to 25; Christmas trees—5 to 15; ornamental trees—25 to 35

Major limitations: hazard of water erosion, hazard of soil blowing, equipment limitations, seedling mortality, plant competition

Suitable management practices and concerns:

- Wood products can be harvested on slopes of less than 30 percent when the canopy cover exceeds 35 percent.
- Maintaining the understory vegetation is essential in controlling erosion.
- Reduce the risk of water erosion and soil blowing by preventing excessive disturbance of the soil and harvesting trees growing on very steep slopes.
- The use of wheeled equipment in harvesting wood products on this soil is severely restricted in most places because of the presence of complex slopes over 15 percent.
- Tree seedlings have a moderately low rate of survival because of high summer temperatures and the prevalence of steep, south- and west-facing slopes.
- Reduce the problem of seedling mortality by leaving some of the larger trees to provide shade for seedling trees.
- Reduce the problem of competition from unwanted plants by preventing the over-harvest of trees.

Livestock grazing

Dominant understory vegetation in potential plant community:

Wyoming big sagebrush, antelope bitterbrush, muttongrass, Indian ricegrass, bottlebrush squirreltail, Stansbury cliffrose, green Mormon tea, alpine sulphurflower

Annual production of air-dry vegetation (pounds per acre):

Favorable years—700

Unfavorable years—300

Present understory plant community:

Wyoming big sagebrush, antelope bitterbrush, alpine sulphurflower, Indian ricegrass, muttongrass

Major limitations: hazard of water erosion, hazard of soil blowing, steep slopes

Suitable management practices and concerns:

- Where the density of the canopy is less than about 30 percent, the understory produces plants suitable for grazing.
- Uniform distribution of grazing is difficult because of the slope, or the lack of permanent water developments, or both.
- Livestock prefer to graze the easily accessible areas before they graze the steep slopes.
- Promote uniform grazing by fencing, properly locating salt licks, and proper stocking.
- Vary the season of grazing and the periods of rest during successive years.
- Control the time and amount of use by livestock.
- Reduce the risk of water erosion and soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.
- The suitability for mechanical range seeding is poor because of soil factors and tree density.

Interpretive Groups

Land capability classification: Nonirrigated—7e

Range site: Not assigned (pj woodland)

411—Sojourn-Badland complex, 15 to 50 percent slopes

Setting

Landform: Hills and escarpments

Position on the landform: **Sojourn**—footslopes and backslopes; **Badland**—backslopes

Shape of areas: Irregular

Size of areas: 100 to 1,500 acres

Elevation: 6,200 to 7,400 feet

Mean annual precipitation: 12 to 16 inches

Mean annual air temperature: 48 to 50 degrees F

Frost-free period: 120 to 140 days

Composition

Sojourn gravelly loam and similar soils: 65 percent

Badland: 20 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The very deep Wetherill soil on eolian-mantled hills

- The very shallow Nizhoni soil on structural benches

- Rock outcrop as exposures of sandstone bedrock occurring as cliffs and slickrock

Characteristics of the Sojourn Soil

Typical profile:

- 0 to 2 inches—light reddish brown gravelly loam
- 2 to 15 inches—light reddish brown silt loam
- 15 inches—siltstone bedrock

Parent material: Residuum derived from siltstone and mudstone

Depth class: Shallow

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Very low

Surface runoff: Rapid

Hazard of water erosion: Very severe

Hazard of soil blowing: Moderate

Characteristics of Badland

Badland consists of exposures of barren siltstone, mudstone, or shale bedrock. It occurs on steep, convex backslopes and is intermingled with the Sojourn soil. There is little or no vegetation, and surface runoff is rapid to very rapid.

Major Uses

Woodland production

Livestock grazing

Woodland production

Dominant overstory vegetation:

pinon (70%), Utah juniper (30%)

Average site index: 60

Overstory production (per acre):

fuelwood—7 to 9 cords in a stand of trees that averages 5 inches in diameter at a height of 1 foot; posts—10 to 20; Christmas trees—45 to 55; ornamental trees—55 to 65

Major limitations: hazard of water erosion, hazard of soil blowing, equipment limitations, seedling mortality, windthrow hazard, plant competition

Suitable management practices and concerns:

- Wood products can be harvested on slopes of less than 30 percent when the canopy cover exceeds 30 percent.
- Maintaining the understory vegetation is essential in controlling erosion.
- Reduce the risk of water erosion and soil blowing by preventing excessive disturbance of the soil and harvesting trees growing on very steep slopes.
- The use of wheeled equipment in harvesting wood products on this soil is severely restricted in most

places because of the presence of complex slopes over 15 percent.

- Tree seedlings have a moderately low rate of survival because of high summer temperatures and the very low water holding capacity of the soil.
- Reduce the problem of seedling mortality by leaving some of the larger trees to provide shade for seedling trees.
- Because roots are restricted by bedrock, trees have a severe hazard of windthrow when the soil is excessively wet and winds are strong.
- To reduce the hazard of windthrow, avoid excessive cutting of trees, limit the width of maintained roads, and avoid making large openings in the canopy.
- Reduce the problem of competition from unwanted plants by preventing the over-harvest of trees.

Livestock grazing

Dominant understory vegetation in potential plant community:

Utah serviceberry, Stansbury cliffrose, Utah snowberry, true (birchleaf) mountainmahogany, muttongrass, green Mormon tea, bottlebrush squirreltail, Indian ricegrass

Annual production of air-dry vegetation (pounds per acre):

Favorable years—600

Unfavorable years—300

Present understory plant community:

Utah serviceberry, Utah snowberry, true mountainmahogany, Stansbury cliffrose, green Mormon tea, muttongrass, Indian ricegrass

Major limitations: hazard of water erosion, hazard of soil blowing, depth to bedrock, steep slopes

Suitable management practices and concerns:

- Where the density of the canopy is less than about 30 percent, the understory produces plants suitable for grazing.
- Uniform distribution of grazing is difficult because of the slope, or the lack of permanent water developments, or both.
- Livestock prefer to graze the easily accessible areas before they graze the steep slopes.
- Promote uniform grazing by fencing, properly locating salt licks, and proper stocking.
- Vary the season of grazing and the periods of rest during successive years.
- Control the time and amount of use by livestock.
- Reduce the risk of water erosion and soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.
- The suitability for mechanical range seeding is poor because of soil factors and tree density.

Interpretive Groups

Land capability classification: **Sojourn**—

nonirrigated—7s; **Badland**—nonirrigated—8s

Range site: **Sojourn**—not assigned (pj woodland);

Badland—not assigned (pj woodland)

412—Highdye-Menefee association, 5 to 35 percent slopes

Setting

Landform: Cuestas and hills

Position on the landform: **Highdye**—dipslopes;

Menefee—footslopes

Slope: **Highdye**—5 to 20 percent; **Menefee**—10 to 35 percent

Shape of areas: Irregular

Size of areas: 100 to 1,000 acres

Elevation: 6,600 to 8,000 feet

Mean annual precipitation: 12 to 16 inches

Mean annual air temperature: 48 to 50 degrees F

Frost-free period: 120 to 140 days

Composition

Highdye flaggy fine sandy loam, very bouldery and similar soils: 45 percent

Menefee channery loam and similar soils: 40 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- Rock outcrop as exposures of sandstone bedrock occurring as small ledges intermingled with the Highdye soil
- The very deep Nomrah soil on eolian-mantled fan terraces
- Menefee soils that have bouldery surfaces on backslopes

Characteristics of the Highdye Soil

Typical profile:

- Soil surface is covered by 1 inch of pinyon needles, twigs, and oak leaves
- 0 to 4 inches—brown flaggy fine sandy loam
- 4 to 13 inches—brown sandy clay
- 13 inches—sandstone bedrock

Parent material: Eolian material, alluvium, and residuum derived from shale and sandstone

Depth class: Shallow

Drainage class: Well drained

Permeability: Slow

Available water capacity: Very low

Surface runoff: Medium

Hazard of water erosion: Very severe

Hazard of soil blowing: Severe

Characteristics of the Menefee Soil

Typical profile:

- 0 to 2 inches—brown channery loam
- 2 to 17 inches—brown and light yellowish brown loam
- 17 inches—siltstone bedrock

Parent material: Alluvium and residuum derived from siltstone and sandstone

Depth class: Shallow

Drainage class: Well drained

Permeability: Moderately slow

Available water capacity: Very low

Surface runoff: Rapid

Hazard of water erosion: Very severe

Hazard of soil blowing: Moderate

Major Uses

Woodland production

Livestock grazing

Woodland production

Highdye soil

Dominant overstory vegetation:

pinyon (70%), Utah juniper (30%)

Average site index: 95

Overstory production (per acre):

fuelwood—12 to 14 cords in a stand of trees that averages 5 inches in diameter at a height of 1 foot; posts—65 to 75; Christmas trees—5 to 15; ornamental trees—50 to 60

Menefee soil

Dominant overstory vegetation:

pinyon (80%), Utah juniper (20%)

Average site index: 60

Overstory production (per acre):

fuelwood—7 to 9 cords in a stand of trees that averages 5 inches in diameter at a height of 1 foot; posts—5 to 15; Christmas trees—5 to 15; ornamental trees—50 to 60

Major limitations:

Highdye—hazard of soil blowing, hazard of water erosion, seedling mortality, windthrow hazard, plant competition

Menefee—hazard of water erosion, hazard of soil blowing, equipment limitations, seedling mortality, windthrow hazard, plant competition

Suitable management practices and concerns:

- Wood products can be harvested on slopes of less than 30 percent when the canopy cover exceeds 35 percent.
- Maintaining the understory vegetation is essential in controlling erosion.

- Reduce the risk of water erosion and soil blowing by preventing excessive disturbance of the soils and harvesting trees growing on steep slopes.

- Tree seedlings have a moderately low rate of survival because of high summer temperatures and the very low water holding capacity of the soils.

- Reduce the problem of seedling mortality by leaving some of the larger trees to provide shade for seedling trees.

- Because roots are restricted by bedrock, trees have a severe hazard of windthrow when the soils are excessively wet and winds are strong.

- To reduce the hazard of windthrow, avoid excessive cutting of trees, limit the width of maintained roads, and avoid making large openings in the canopy.

- Reduce the problem of competition from unwanted plants by preventing the over-harvest of trees.

Menefee soil

- The use of wheeled equipment in harvesting wood products on this soil is moderately restricted in most places because of the presence of slopes over 15 percent.

Livestock grazing

Highdye soil

Dominant understory vegetation in potential plant community:

muttongrass, Gambel oak, bottlebrush squirreltail, thrifty goldenweed, blue grama, Ross sedge, true mountainmahogany, Stansbury cliffrose, broom snakeweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—600

Unfavorable years—400

Present understory plant community:

muttongrass, bottlebrush squirreltail, blue grama, thrifty goldenweed, Gambel oak, true mountainmahogany, Stansbury cliffrose

Menefee soil

Dominant understory vegetation in potential plant community:

true mountainmahogany, Utah serviceberry, datil yucca, green Mormon tea, bottlebrush squirreltail, thrifty goldenweed, broom snakeweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—600

Unfavorable years—300

Present understory plant community:

Utah serviceberry, true mountainmahogany, datil yucca, green Mormon tea, thrifty goldenweed, bottlebrush squirreltail

Major limitations:

Highdye—hazard of soil blowing, hazard of water erosion, depth to bedrock, presence of rock outcrops

Menefee—hazard of water erosion, hazard of soil blowing, depth to bedrock

Suitable management practices and concerns:

- Where the density of the canopy is less than about 35 percent, the understory produces plants suitable for grazing.
- Uniform distribution of grazing is difficult because of the slope, or the lack of permanent water developments, or both.
- Livestock prefer to graze the easily accessible areas before they graze the steep slopes.
- Promote uniform grazing by fencing, properly locating salt licks, and proper stocking.
- Vary the season of grazing and the periods of rest during successive years.
- Control the time and amount of use by livestock.
- Reduce the risk of water erosion and soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.
- The suitability for mechanical range seeding is poor because of soil factors and tree density.

Interpretive Groups

Land capability classification: **Highdye**—

nonirrigated—7s; **Menefee**—nonirrigated—7s

Range site: **Highdye**—not assigned (pj woodland);

Menefee—not assigned (pj woodland)

413—Hozho-Quezcan-Rock outcrop complex, 35 to 70 percent slopes

Setting

Landform: Escarpments of mesas, cuestras, and buttes

Position on the landform: **Hozho**—backslopes;

Quezcan—backslopes; **Rock outcrop**—cliffs

Slope: **Hozho**—40 to 70 percent; **Quezcan**—35 to 65 percent

Shape of areas: Irregular to elongate

Size of areas: 50 to 1,000 acres

Elevation: 6,500 to 8,000 feet

Mean annual precipitation: 12 to 16 inches

Mean annual air temperature: 48 to 50 degrees F

Frost-free period: 120 to 140 days

Composition

Hozho cobbly sandy loam, extremely bouldery and similar soils: 55 percent

Quezcan very cobbly clay loam, extremely bouldery and similar soils: 25 percent

Rock outcrop: 10 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- The very deep Espiritu soil on small landslides
- The very shallow Nizhoni soil on structural benches
- The very deep Tsezhin soil on small fan terraces

Characteristics of the Hozho Soil

Typical profile:

- 0 to 3 inches—reddish brown cobbly sandy loam
- 3 to 6 inches—reddish brown sandy loam
- 6 to 14 inches—pinkish gray and very pale brown loamy sand
- 14 inches—soft sandstone bedrock

Parent material: Colluvium and residuum derived from sandstone

Depth class: Shallow

Drainage class: Excessively drained

Permeability: Rapid

Available water capacity: Very low

Surface runoff: Rapid

Hazard of water erosion: Very severe

Hazard of soil blowing: Moderate

Characteristics of the Quezcan Soil

Typical profile:

- 0 to 3 inches—light gray very cobbly clay loam
- 3 to 6 inches—light gray gravelly clay loam
- 6 to 10 inches—light gray clay loam
- 10 to 27 inches—pink and light gray silty clay loam
- 27 inches—shale bedrock

Parent material: Colluvium and residuum derived from shale, claystone, and sandstone

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Slow

Available water capacity: Low

Surface runoff: Rapid

Hazard of water erosion: Very severe

Hazard of soil blowing: Moderate

Shrink-swell potential: High

Characteristics of Rock outcrop

Rock outcrop consists of exposures of sandstone bedrock. It occurs as vertical cliffs and irregular ledges ranging from 10 to 30 feet high. It is intermingled with the Hozho soil and is above the Quezcan soil. There is little or no vegetation, and surface runoff is very rapid.

Major Uses

Woodland production

Livestock grazing

Woodland production

Hozho soil

Dominant overstory vegetation:

pinyon (70%), Utah juniper (30%)

Average site index: 35

Overstory production (per acre):

fuelwood—3 to 4 cords in a stand of trees that averages 5 inches in diameter at a height of 1 foot; posts—0 to 5; Christmas trees—5 to 10; ornamental trees—5 to 10

Quezcan soil

Dominant overstory vegetation:

pinyon (50%), Utah juniper (50%)

Average site index: 45

Overstory production (per acre):

fuelwood—5 to 6 cords in a stand of trees that averages 5 inches in diameter at a height of 1 foot; posts—5 to 10; Christmas trees—5 to 10; ornamental trees—5 to 10

Major limitations:

Hozho—hazard of water erosion, hazard of soil blowing, equipment limitations, seedling mortality, windthrow hazard, low productivity

Quezcan—hazard of water erosion, hazard of soil blowing, equipment limitations, seedling mortality, windthrow hazard, plant competition, low productivity

Suitable management practices and concerns:

- Wood products should not be harvested on these soils because of low production and very steep slopes.
- The use of wheeled equipment in harvesting wood products on these soils is severely restricted in most places because of the presence of slopes over 35 percent and numerous rock outcrops.
- Reduce the risk of water erosion and soil blowing by preventing excessive disturbance of the soils and harvesting trees growing on these steep slopes.

Livestock grazing

Hozho soil

Dominant understory vegetation in potential plant community:

antelope bitterbrush, Indian ricegrass, true mountainmahogany, muttongrass, blue grama, narrowleaf yucca

Annual production of air-dry vegetation (pounds per acre):

Favorable years—400

Unfavorable years—200

Present understory plant community:

antelope bitterbrush, muttongrass, Indian ricegrass, blue grama, narrowleaf yucca, Bigelow sagebrush, true mountainmahogany

Quezcan soil

Dominant understory vegetation in potential plant community:

true mountainmahogany, muttongrass, Indian ricegrass, antelope bitterbrush, bottlebrush squirreltail, salina (saline) wildrye, Utah serviceberry, thrifty goldenweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—400

Unfavorable years—200

Present understory plant community:

muttongrass, Indian ricegrass, true mountainmahogany, bottlebrush squirreltail, salina wildrye, antelope bitterbrush, Utah serviceberry, thrifty goldenweed

Major limitations:

Hozho—hazard of water erosion, hazard of soil blowing, steep slopes, depth to bedrock, sandy textures, presence of rock outcrops

Quezcan—hazard of water erosion, hazard of soil blowing, steep slopes, shrink-swell potential

Suitable management practices and concerns:

- Where the density of the canopy is less than about 30 percent, the understory produces plants suitable for grazing.
- Maintaining the understory vegetation is essential in controlling erosion.
- Uniform distribution of grazing is difficult because of the slope, or the lack of permanent water developments, or both.
- Livestock prefer to graze the easily accessible areas before they graze the steep slopes.
- Vary the season of grazing and the periods of rest during successive years.
- Control the time and amount of use by livestock.

- Reduce the risk of water erosion and soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.
- The suitability for mechanical range seeding is poor because of soil factors and tree density.

Interpretive Groups

Land capability classification: **Hozho**—nonirrigated—7e; **Quezcan**—nonirrigated—7e; **Rock outcrop**—nonirrigated—8s

Range site: **Hozho**—not assigned (pj woodland); **Quezcan**—not assigned (pj woodland); **Rock outcrop**—not assigned

414—Arabrab-Wetherill complex, 3 to 15 percent slopes

Setting

Landform: Mesas

Position on the landform: **Arabrab**—summits; **Wetherill**—eolian-mantled summits

Slope: **Arabrab**—5 to 15 percent; **Wetherill**—3 to 15 percent

Shape of areas: Irregular

Size of areas: 100 to 1,000 acres

Elevation: 7,000 to 8,500 feet

Mean annual precipitation: 14 to 16 inches

Mean annual air temperature: 48 to 50 degrees F

Frost-free period: 120 to 140 days

Composition

Arabrab very flaggy very fine sandy loam, very stony and similar soils: 55 percent

Wetherill very fine sandy loam and similar soils: 30 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- Rock outcrop as exposures of sandstone or diorite bedrock occurring as small areas on slickrock or small ledges
- Arabrab soils that lack rock fragments on the surface

Characteristics of the Arabrab Soil

Typical profile:

- 0 to 3 inches—reddish brown very flaggy very fine sandy loam
- 3 to 12 inches—reddish brown sandy clay loam and gravelly sandy clay loam
- 12 to 16 inches—reddish brown flaggy sandy clay loam

- 16 inches—diorite bedrock

Parent material: Alluvium and residuum derived from sandstone and quartz diorite

Depth class: Shallow

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Very low

Surface runoff: Medium

Hazard of water erosion: Moderate

Hazard of soil blowing: Severe

Characteristics of the Wetherill Soil

Typical profile:

- 0 to 3 inches—reddish brown very fine sandy loam
- 3 to 23 inches—reddish brown sandy clay loam
- 23 to 41 inches—reddish brown sandy clay loam
- 41 to 52 inches—reddish gray cobbly sandy clay loam
- 52 inches—sandstone bedrock

Parent material: Eolian material and alluvium derived from siltstone and sandstone

Depth class: Deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: High

Surface runoff: Medium

Hazard of water erosion: Very severe

Hazard of soil blowing: Moderate

Major Uses

Woodland production

Livestock grazing

Woodland production

Arabrab soil

Dominant overstory vegetation: pinyon (85%), Utah juniper (15%)

Average site index: 90

Overstory production (per acre):

fuelwood—15 to 17 cords in a stand of trees that averages 5 inches in diameter at a height of 1 foot; posts—40 to 50; Christmas trees—20 to 30; ornamental trees—20 to 30

Wetherill soil

Dominant overstory vegetation: pinyon (90%), Utah juniper (10%)

Average site index: 105

Overstory production (per acre):

fuelwood—19 to 21 cords in a stand of trees that averages 5 inches in diameter at a height of 1 foot; posts—50 to 60; Christmas trees—20 to 30; ornamental trees—20 to 30

Major limitations:

Arabrab—hazard of water erosion, hazard of soil

blowing, equipment limitations, seedling mortality, windthrow hazard, plant competition

Wetherill—hazard of water erosion, hazard of soil blowing, plant competition

Suitable management practices and concerns:

- Wood products can be harvested when the canopy cover exceeds 35 percent.
- Maintaining the understory vegetation is essential in controlling erosion.
- Reduce the risk of water erosion and soil blowing by preventing excessive disturbance of the soils.
- Restrict the use of wheeled equipment to periods when the soils are dry or frozen to reduce compaction and subsequent water erosion.
- Reduce the problem of competition from unwanted plants by preventing the over-harvest of trees.

Arabrab soil

- The use of wheeled equipment in harvesting wood products on this soil is moderately restricted in most places because of the presence of rock outcrops.
- Tree seedlings have a moderately low rate of survival because of high summer temperatures and the very low water holding capacity of the soil.
- Reduce the problem of seedling mortality by leaving some of the larger trees to provide shade for seedling trees.
- Because roots are restricted by bedrock, trees have a severe hazard of windthrow when the soil is excessively wet and winds are strong.
- To reduce the hazard of windthrow, avoid excessive cutting of trees, limit the width of maintained roads, and avoid making large openings in the canopy.

Livestock grazing

Arabrab soil

Dominant understory vegetation in potential plant community:

muttongrass, black sagebrush, Gambel oak, turbinella (shrub live) oak, datil yucca, Siler (toadflax) penstemon, silvery lupine, Utah serviceberry, thrifty goldenweed, dwarf lousewort

Annual production of air-dry vegetation (pounds per acre):

Favorable years—400

Unfavorable years—200

Present understory plant community:

muttongrass, black sagebrush, Gambel oak, turbinella oak, datil yucca, Siler penstemon, silvery lupine, Utah serviceberry, thrifty goldenweed

Wetherill soil

Dominant understory vegetation in potential plant community:

Wyoming big sagebrush, muttongrass, bottlebrush

squirrelnail, silvery lupine, Gambel oak, datil yucca, dwarf lousewort

Annual production of air-dry vegetation (pounds per acre):

Favorable years—450

Unfavorable years—250

Present understory plant community:

Wyoming big sagebrush, muttongrass, datil yucca, silvery lupine, bottlebrush squirrelnail, dwarf lousewort, Gambel oak

Major limitations:

Arabrab—hazard of water erosion, hazard of soil blowing, depth to bedrock, presence of rock outcrops

Wetherill—hazard of water erosion, hazard of soil blowing

Suitable management practices and concerns:

- Where the density of the canopy is less than about 30 percent, the understory produces plants suitable for grazing.
- Promote uniform grazing by fencing, properly locating salt licks, and proper stocking.
- Vary the season of grazing and the periods of rest during successive years.
- Control the time and amount of use by livestock.
- Reduce the risk of water erosion and soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Wetherill soil

- This soil is unsuitable for mechanical range seeding because of tree density.
- The chaining or crushing of trees are not recommended practices.
- Where the trees have been removed by chaining the present plant community is dominated by crested wheatgrass, Wyoming big sagebrush, and Gambel oak.
- To increase forage production, seed disturbed areas to suited grasses by broadcasting.
- Adequate site preparation is needed for successful seeding of understory plants.
- Seed late in the fall for best results.
- After seeding, defer grazing until the young plants are well established.

Arabrab soil

- The suitability for mechanical range seeding is poor because of soil factors and tree density.

Interpretive Groups

Land capability classification: **Arabrab**—

nonirrigated—7s; **Wetherill**—nonirrigated—4c

Range site: **Arabrab**—not assigned (pj woodland);

Wetherill—not assigned (pj woodland)

415—Tsezhin extremely cobbly very fine sandy loam, 35 to 70 percent slopes, rubbly

Setting

Landform: Alluvial cones

Shape of areas: Irregular

Size of areas: 30 to 1,000 acres

Elevation: 6,200 to 7,800 feet

Mean annual precipitation: 12 to 16 inches

Mean annual air temperature: 48 to 50 degrees F

Frost-free period: 120 to 140 days

Composition

Tsezhin soil and similar soils: 85 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- Very deep soils that lack many rock fragments and have higher calcium carbonate content, on alluvial cones
- The shallow Arabrab soil on summits of hills and dipslopes of cuestras
- The very cobbly, moderately coarse textured Katzine soil on steep alluvial cones
- The moderately fine textured Wetherill soil on eolian-mantled footslopes

Typical Profile

- 0 to 4 inches—reddish brown extremely cobbly very fine sandy loam
- 4 to 25 inches—yellowish red and light reddish brown very cobbly sandy clay loam
- 25 to 62 inches—pink and pinkish white very cobbly sandy clay loam

Soil Properties and Qualities

Parent material: Alluvium derived from sandstone and quartz diorite

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Low to moderate

Surface runoff: Rapid

Hazard of water erosion: Very severe

Hazard of soil blowing: Very slight

Major Uses

Woodland production

Livestock grazing

Woodland production

Dominant overstory vegetation:

pinyon (65%), Utah juniper (35%)

Average site index: 55

Overstory production (per acre):

fuelwood—6 to 8 cords in a stand of trees that averages 5 inches in diameter at a height of 1 foot; posts—20 to 30; Christmas trees—10 to 20; ornamental trees—10 to 20

Major limitations: hazard of water erosion, equipment limitations, seedling mortality, plant competition

Suitable management practices and concerns:

- Wood products are difficult to harvest on this soil because of the steep, rocky slopes.
- The use of wheeled equipment in harvesting wood products on this soil is severely restricted in most places because of the presence of slopes over 35 percent.
- Reduce the risk of water erosion by preventing excessive disturbance of the soil and harvesting trees growing on these steep slopes.
- Tree seedlings have a moderately low rate of survival because of high summer temperatures and the low to moderate water holding capacity of the soil.
- Reduce the problem of seedling mortality by leaving some of the larger trees to provide shade for seedling trees.

Livestock grazing

Dominant understory vegetation in potential plant community:

black sagebrush, muttongrass, bottlebrush squirreltail, earth sedge, Wyoming big sagebrush, green Mormon tea, thrifty goldenweed, Utah serviceberry

Annual production of air-dry vegetation (pounds per acre):

Favorable years—600

Unfavorable years—200

Present understory plant community:

black sagebrush, Wyoming big sagebrush, muttongrass, bottlebrush squirreltail, earth sedge, green Mormon tea, Utah serviceberry, thrifty goldenweed

Major limitations: hazard of water erosion, surface and subsurface rock fragments, steep slopes

Suitable management practices and concerns:

- Where the density of the canopy is less than about 30 percent, the understory produces plants suitable for grazing.

- Maintaining the understory vegetation is essential in controlling erosion.
- Uniform distribution of grazing is difficult because of the slope, or the lack of permanent water developments, or both.
- Livestock prefer to graze the easily accessible areas before they graze the steep slopes.
- Vary the season of grazing and the periods of rest during successive years.
- Control the time and amount of use by livestock.
- Reduce the risk of water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.
- The suitability for mechanical range seeding is poor because of soil factors and tree density.

Interpretive Groups

Land capability classification: Nonirrigated—7e

Range site: Not assigned (pj woodland)

416—Arabrab-Rock outcrop complex, 15 to 60 percent slopes

Setting

Landform: Cuestas

Position on the landform: **Arabrab**—dipslopes; **Rock outcrop**—cliffs and ledges

Shape of areas: Irregular

Size of areas: 200 to 1,000 acres

Elevation: 6,200 to 8,200 feet

Mean annual precipitation: 12 to 16 inches

Mean annual air temperature: 48 to 50 degrees F

Frost-free period: 120 to 140 days

Composition

Arabrab extremely cobbly very fine sandy loam, extremely stony and similar soils: 70 percent

Rock outcrop: 20 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- The very deep Tsezhin soil, rubbly phase, on alluvial cones
- An extremely cobbly soil which is moderately deep to diorite bedrock, on backslopes below map unit 616

Characteristics of the Arabrab Soil

Typical profile:

- 0 to 2 inches—reddish brown extremely cobbly very fine sandy loam
- 2 to 15 inches—yellowish red and light reddish brown gravelly sandy clay loam

- 15 inches—sandstone bedrock

Parent material: Alluvium derived from sandstone and quartz diorite

Depth class: Shallow

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Very low

Surface runoff: Rapid

Hazard of water erosion: Very severe

Hazard of soil blowing: Very slight

Characteristics of Rock outcrop

Rock outcrop consists of exposures of quartz diorite or sandstone bedrock. It occurs as small cliffs in shallow canyons or as irregular ledges on dipslopes of cuestas. There is little or no vegetation, and surface runoff is rapid to very rapid.

Major Uses

Woodland production

Livestock grazing

Woodland production

Dominant overstory vegetation:

pinon (55%), Utah juniper (45%)

Average site index: 80

Overstory production (per acre):

fuelwood—11 to 13 cords in a stand of trees that averages 5 inches in diameter at a height of 1 foot; posts—50 to 60; Christmas trees—25 to 35; ornamental trees—75 to 85

Major limitations: hazard of water erosion, equipment limitations, seedling mortality, windthrow hazard, plant competition

Suitable management practices and concerns:

- Wood products can be harvested on slopes of less than 35 percent when the canopy cover exceeds 35 percent.
- Maintaining the understory vegetation is essential in controlling erosion.
- Reduce the risk of water erosion by preventing excessive disturbance of the soil and harvesting trees growing on very steep slopes.
- The use of wheeled equipment in harvesting wood products on this soil is severely restricted in most places because of the presence of slopes over 35 percent and numerous rock outcrops.
- Tree seedlings have a moderately low rate of survival because of high summer temperatures and the very low water holding capacity of the soil.
- Reduce the problem of seedling mortality by leaving some of the larger trees to provide shade for seedling trees.

- Because roots are restricted by bedrock, trees have a severe hazard of windthrow when the soil is excessively wet and winds are strong.
- To reduce the hazard of windthrow, avoid excessive cutting of trees, limit the width of maintained roads, and avoid making large openings in the canopy.
- Reduce the problem of competition from unwanted plants by preventing the over-harvest of trees.

Livestock grazing

Dominant understory vegetation in potential plant community:

black sagebrush, muttongrass, bottlebrush squirreltail, earth sedge, datil yucca, Siler (toadflax) penstemon, Utah serviceberry, fenderbush, thrifty goldenweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—400

Unfavorable years—200

Present understory plant community:

muttongrass, bottlebrush squirreltail, earth sedge, black sagebrush, datil yucca, Siler penstemon, silvery lupine, thrifty goldenweed

Major limitations: hazard of water erosion, depth to bedrock, surface rock fragments, steep slopes, presence of rock outcrops

Suitable management practices and concerns:

- Where the density of the canopy is less than about 30 percent, the understory produces plants suitable for grazing.
- Uniform distribution of grazing is difficult because of the slope, or the lack of permanent water developments, or both.
- Livestock prefer to graze the easily accessible areas before they graze the steep slopes.
- Vary the season of grazing and the periods of rest during successive years.
- Control the time and amount of use by livestock.
- Reduce the risk of water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.
- The suitability for mechanical range seeding is poor because of soil factors and tree density.

Interpretive Groups

Land capability classification: **Arabrab**—nonirrigated—7e; **Rock outcrop**—nonirrigated—8s

Range site: **Arabrab**—not assigned (pj woodland); **Rock outcrop**—not assigned (pj woodland)

417—Wetherill very fine sandy loam, 5 to 25 percent slopes

Setting

Landform: Eolian-mantled fan terraces

Shape of areas: Irregular

Size of areas: 100 to 500 acres

Elevation: 7,200 to 7,800 feet

Mean annual precipitation: 14 to 16 inches

Mean annual air temperature: 48 to 50 degrees F

Frost-free period: 120 to 140 days

Composition

Wetherill soil and similar soils: 80 percent

Contrasting inclusions: 20 percent

Contrasting Inclusions

- A moist phase of the cobbly Tsezhin soil on higher portions of fan terraces
- A dark, coarse textured soil on occasionally flooded alluvial fans under Gambel oak
- Stony riverwash in washes

Typical Profile

- 0 to 3 inches—reddish brown very fine sandy loam
- 3 to 25 inches—reddish brown and yellowish red sandy clay loam
- 25 to 61 inches—yellowish red and light reddish brown sandy clay loam
- 61 to 66 inches—reddish brown very fine sandy loam

Soil Properties and Qualities

Parent material: Eolian material and alluvium derived from sandstone, siltstone, and quartz diorite

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: High to very high

Surface runoff: Medium

Hazard of water erosion: Very severe

Hazard of soil blowing: Moderate

Major Uses

Woodland production

Livestock grazing

Woodland production

Dominant overstory vegetation: pinyon (90%), Utah juniper (10%)

Average site index: 105

Overstory production (per acre):

fuelwood—17 to 20 cords in a stand of trees that averages 5 inches in diameter at a height of 1 foot; posts—5 to 10; Christmas trees—20 to 30; ornamental trees—20 to 30

Major limitations: hazard of water erosion, hazard of soil blowing, equipment limitations, plant competition

Suitable management practices and concerns:

- Wood products can be harvested when the canopy cover exceeds 35 percent.
- Maintaining the understory vegetation is essential in controlling erosion.
- Reduce the risk of water erosion and soil blowing by preventing excessive disturbance of the soil.
- Restrict the use of wheeled equipment to periods when the soil is dry or frozen to reduce compaction and subsequent water erosion.
- The use of wheeled equipment in harvesting wood products on this soil is moderately restricted in most places because of the presence of slopes over 15 percent.
- Reduce the problem of competition from unwanted plants by preventing the over-harvest of trees.

Livestock grazing

Dominant understory vegetation in potential plant community:

Gambel oak, muttongrass, datil yucca, Wyoming big sagebrush, fenderbush, Utah serviceberry

Annual production of air-dry vegetation (pounds per acre):

Favorable years—450

Unfavorable years—250

Present understory plant community:

Gambel oak, datil yucca, muttongrass, Utah serviceberry, fenderbush

Major limitations: hazard of water erosion, hazard of soil blowing

Suitable management practices and concerns:

- Where the density of the canopy is less than about 30 percent, the understory produces plants suitable for grazing.
- Promote uniform grazing by fencing, properly locating salt licks, and proper stocking.
- Vary the season of grazing and the periods of rest during successive years.
- Control the time and amount of use by livestock.
- Reduce the risk of water erosion and soil blowing

by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

- This soil is unsuitable for mechanical range seeding because of tree density.
- The chaining or crushing of trees are not recommended practices.
- Where the trees have been removed by chaining the present plant community is dominated by crested wheatgrass, Wyoming big sagebrush, and Gambel oak.
- To increase forage production, seed disturbed areas to suited grasses by broadcasting.
- Adequate site preparation is needed for successful seeding of understory plants.
- Seed late in the fall for best results.
- After seeding, defer grazing until the young plants are well established.

Interpretive Groups

Land capability classification: Nonirrigated—6e

Range site: Not assigned (pj woodland)

418—Menefee-Espiritu-Rock outcrop complex, 35 to 75 percent slopes

Setting

Landform: Escarpments of cuestas and mesas

Position on the landform: **Menefee**—backslopes;

Espiritu—small landslides; **Rock outcrop**—cliffs

Slope: **Menefee**—35 to 55 percent; **Espiritu**—35 to 75 percent

Shape of areas: Elongate

Size of areas: 20 to 500 acres

Elevation: 6,400 to 8,000 feet

Mean annual precipitation: 12 to 16 inches

Mean annual air temperature: 48 to 50 degrees F

Frost-free period: 120 to 140 days

Composition

Menefee very channery clay loam, extremely bouldery and similar soils: 50 percent

Espiritu extremely flaggy sandy loam, rubbly and similar soils: 30 percent

Rock outcrop: 10 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- Badland of clay shale bedrock occurring on steep, barren hills bordering washes

- The Iwela soil on small landslides with slopes of 10 to 35 percent

Characteristics of the Menefee Soil

Typical profile:

- 0 to 2 inches—grayish brown very channery clay loam
- 2 to 18 inches—light gray and grayish brown silty clay loam
- 18 inches—interbedded siltstone and shale bedrock

Parent material: Colluvium and residuum derived from siltstone, shale, and sandstone

Depth class: Shallow

Drainage class: Well drained

Permeability: Moderately slow

Available water capacity: Very low

Surface runoff: Rapid

Hazard of water erosion: Very severe

Hazard of soil blowing: Moderate

Characteristics of the Espiritu Soil

Typical profile:

- 0 to 6 inches—brown extremely flaggy sandy loam
- 6 to 24 inches—brown very channery sandy loam and very cobbly sandy loam
- 24 to 42 inches—light brown very cobbly sandy clay loam
- 42 to 70 inches—pale brown cobbly very fine sandy loam

Parent material: Colluvium and residuum derived from sandstone and siltstone

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Low to moderate

Surface runoff: Medium

Hazard of water erosion: Severe

Hazard of soil blowing: Very slight

Characteristics of Rock outcrop

Rock outcrop consists of exposures of sandstone bedrock. It occurs as vertical or steeply sloping cliffs immediately above the Espiritu soil. There is little or no vegetation, and surface runoff is very rapid.

Major Uses

Woodland production
Livestock grazing

Woodland production

Menefee soil

Dominant overstory vegetation:

pinyon (80%), Utah juniper (20%)

Average site index: 60

Overstory production (per acre):

fuelwood—8 to 10 cords in a stand of trees that averages 5 inches in diameter at a height of 1 foot; posts—15 to 20; Christmas trees—10 to 15; ornamental trees—10 to 20

Espiritu soil

Dominant overstory vegetation:

pinyon (80%), Utah juniper (20%)

Average site index: 65

Overstory production (per acre):

fuelwood—9 to 11 cords in a stand of trees that averages 5 inches in diameter at a height of 1 foot; posts—15 to 20; Christmas trees—5 to 10; ornamental trees—5 to 10

Major limitations:

Menefee—hazard of water erosion, hazard of soil blowing, equipment limitations, seedling mortality, windthrow hazard, plant competition

Espiritu—hazard of water erosion, equipment limitations, seedling mortality, plant competition

Suitable management practices and concerns:

- Wood products should not be harvested because of very steep slopes.
- The use of wheeled equipment in harvesting wood products on this soil is severely restricted in most places because of the presence of slopes over 35 percent, large surface stones, and numerous rock outcrops.
- Reduce the risk of water erosion and soil blowing by preventing excessive disturbance of the soils and harvesting trees growing on these steep slopes.

Livestock grazing

Menefee soil

Dominant understory vegetation in potential plant community:

true (birchleaf) mountainmahogany, Utah serviceberry, Gambel oak, muttongrass, fendlerbush, narrowleaf yucca, earth sedge

Annual production of air-dry vegetation (pounds per acre):

Favorable years—600

Unfavorable years—300

Present understory plant community:

true mountainmahogany, Utah serviceberry, Gambel oak, fendlerbush, muttongrass, earth sedge

Espiritu soil

Dominant understory vegetation in potential plant community:

true mountainmahogany, Utah serviceberry, muttongrass, Indian ricegrass, earth sedge, Gambel oak, datil yucca, narrowleaf yucca

Annual production of air-dry vegetation (pounds per acre):

Favorable years—600

Unfavorable years—300

Present understory plant community:

true mountainmahogany, Utah serviceberry, datil yucca, narrowleaf yucca, muttongrass, earth sedge

Major limitations:

Menefee—hazard of water erosion, hazard of soil blowing, steep slopes, depth to bedrock

Espiritu—hazard of water erosion, steep slopes, surface and subsurface rock fragments, presence of rock outcrops

Suitable management practices and concerns:

- Where the density of the canopy is less than about 35 percent, the understory produces plants suitable for grazing.
- Maintaining the understory vegetation is essential in controlling erosion.
- Uniform distribution of grazing is difficult because of the slope, or the lack of permanent water developments, or both.
- Livestock prefer to graze the easily accessible areas before they graze the steep slopes.
- Vary the season of grazing and the periods of rest during successive years.
- Control the time and amount of use by livestock.
- Reduce the risk of water erosion and soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.
- The suitability for mechanical range seeding is poor because of soil factors.

Interpretive Groups

Land capability classification: **Menefee**—

nonirrigated—7e; **Espiritu**—nonirrigated—7e;

Rock outcrop—nonirrigated—8s

Range site: **Menefee**—not assigned (pj woodland);

Espiritu—not assigned (pj woodland); **Rock outcrop**—not assigned

500—Whit very fine sandy loam, 1 to 3 percent slopes

Setting

Landform: Eolian-mantled fan terraces and summits of mesas

Shape of areas: Irregular

Size of areas: 100 to 7,000 acres

Elevation: 5,500 to 6,100 feet

Mean annual precipitation: 6 to 8 inches

Mean annual air temperature: 52 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Whit soil and similar soils: 85 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The moderately coarse textured Sogzie soil on elongate crest areas
- Fine textured, sodic soils in small depressions north of Red Rock, Arizona
- The gravelly Blackston soil on high stream terraces along Red Wash

Typical profile

- 0 to 10 inches—yellowish red very fine sandy loam
- 10 to 38 inches—yellowish red sandy clay loam and loam
- 38 to 65 inches—pink and reddish yellow loam and fine sandy loam

Soil Properties and Qualities

Parent material: Eolian material derived from siltstone and sandstone

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: High to very high

Surface runoff: Medium

Hazard of water erosion: Moderate

Hazard of soil blowing: Severe

Major Uses

Livestock grazing

Dominant vegetation in potential plant community:

galleta, Indian ricegrass, fourwing saltbush, bottlebrush squirreltail, blue grama, sand dropseed, winterfat, broom snakeweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—700

Unfavorable years—300

Present plant community:

galleta, broom snakeweed, bottlebrush squirreltail, blue grama, sand dropseed

Major limitations: hazard of soil blowing, hazard of water erosion

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: Nonirrigated—7c

Range site: Loamy Upland 6-10" p.z.

501—Escavada-Riverwash complex, 0 to 1 percent slopes

Setting

Landform: Valley floors

Position on the landform: **Escavada**—flood plains;

Riverwash—channels

Shape of areas: Long and narrow

Size of areas: 250 to 1,000 acres

Elevation: 4,600 to 6,200 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 52 to 56 degrees F

Frost-free period: 140 to 170 days

Composition

Escavada loamy fine sand and similar soils: 45 percent

Riverwash: 40 percent

Contrasting Inclusions: 15 percent

Contrasting Inclusions

- The moderately sodic Shumbegay soil on hummocks and stable dunes of low stream terraces

- The somewhat excessively drained Sheppard soil on stable dunes

Characteristics of the Escavada Soil

Typical profile:

- 0 to 5 inches—yellowish red loamy fine sand
- 5 to 19 inches—reddish yellow fine sand
- 19 to 31 inches—reddish brown fine sand with strata of silt loam
- 31 to 45 inches—yellowish red loamy fine sand
- 45 to 70 inches—reddish yellow fine sand

Parent material: Alluvium derived from sandstone and shale

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Low

Surface runoff: Very slow

Hazard of water erosion: Very slight

Hazard of soil blowing: Very slight

Flooding frequency: occasional, very brief periods

Depth to seasonal high water table: 5.0 to 6.0 feet

Characteristics of Riverwash

Riverwash consists of unstable sand, silt, and cobbles that is reworked by water and wind so frequently that it supports little or no vegetation. Riverwash occurs in stream channels and is subject to frequent, brief periods of flooding from prolonged high-intensity storms.

Major Uses

Livestock grazing

Dominant vegetation in potential plant community:

Indian ricegrass, western wheatgrass, alkali sacaton, fourwing saltbush, sand dropseed, green rubber rabbitbrush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—1,100

Unfavorable years—800

Present plant community:

green rubber rabbitbrush, saltcedar, basin big sagebrush, cheatgrass, western wheatgrass, alkali sacaton

Major limitations: hazard of soil blowing, flooding

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.

- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Escavada**—nonirrigated—6e; **Riverwash**—nonirrigated—8s
Range site: **Escavada**—Sandy Bottom 6-10" p.z.;
Riverwash—not assigned

502—Sogzie loamy fine sand, 1 to 5 percent slopes

Setting

Landform: Summits of undulating plateaus and mesas
Shape of areas: Irregular
Size of areas: 100 to 2,000 acres
Elevation: 5,500 to 6,100 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 140 to 160 days

Composition

Sogzie soil and similar soils: 85 percent
 Contrasting inclusions: 15 percent

Contrasting Inclusions

- Fine textured, sodic soils on small depressions north of Red Rock, Arizona
- The medium textured Whit soil on small areas between low hummocks
- The coarse textured Sheppard soil on stable dunes

Typical Profile

- 0 to 10 inches—yellowish red loamy fine sand
- 10 to 50 inches—light reddish brown and pink very fine sandy loam
- 50 to 70 inches—reddish yellow fine sandy loam

Soil Properties and Qualities

Parent material: Eolian material derived from sandstone and siltstone
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: Moderate to high

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Very severe

Major Uses

Livestock grazing

Dominant vegetation in potential plant community:
 Indian ricegrass, galleta, blue grama, bottlebrush squirreltail, Cutler Mormon tea, fourwing saltbush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—700

Unfavorable years—350

Present plant community:

galleta, Indian ricegrass, blue grama, Fendler threeawn, broom snakeweed, Greene rabbitbrush, fourwing saltbush

Major limitations: hazard of soil blowing

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: Nonirrigated—7c

Range site: Sandy Loam Upland 6-10" p.z.

503—Claysprings-Badland complex, 35 to 60 percent slopes

Setting

Landform: Escarpments of mesas, buttes, and structural benches

Position on the landform: **Claysprings**—backslopes;
Badland—barren backslopes

Shape of areas: Elongated

Size of areas: 20 to 500 acres

Elevation: 4,700 to 5,500 feet

Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 140 to 160 days

Composition

Claysprings extremely gravelly sandy clay loam,
 rubbly and similar soils: 60 percent
 Badland: 30 percent
 Contrasting inclusions: 10 percent

Contrasting Inclusions

- The deep Tohona soil on summits of small structural benches
- Rock outcrop as small sandstone cliffs and ledges

Characteristics of the Claysprings Soil

Typical profile:

- 0 to 2 inches—light brown extremely gravelly sandy clay loam
- 2 to 4 inches—light brown and light greenish gray clay
- 4 to 12 inches—light greenish gray clay
- 12 inches—shale bedrock

Parent material: Colluvium and residuum derived from sandstone, claystone, and shale

Depth class: Shallow

Drainage class: Well drained

Permeability: Very slow

Available water capacity: Very low

Surface runoff: Rapid

Hazard of water erosion: Severe

Hazard of soil blowing: Very slight

Salinity: Slightly saline below a depth of 4 inches

Sodicity: Moderately sodic below a depth of 2 inches

Shrink-swell potential: High

Characteristics of Badland

Badland consists of exposures of shale and claystone bedrock. It occurs as steep, convex cones intermingled with the Claysprings soil. There is little or no vegetation, and surface runoff is rapid to very rapid.

Major Uses

Livestock grazing

Dominant vegetation in potential plant community: galleta, shadscale, Indian ricegrass, alkali sacaton, bud sagebrush, mound saltbush
Annual production of air-dry vegetation (pounds per acre):

Favorable years—400

Unfavorable years—200

Present plant community:

galleta, cheatgrass, Indian ricegrass, shadscale, bud sagebrush, broom snakeweed

Major limitations: hazard of water erosion, steep slopes, surface rock fragments, shrink-swell potential

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Uniform distribution of grazing is difficult because of the slope or the lack of permanent water developments, or both.
- Livestock prefer to graze the easily accessible areas before they graze the steep slopes.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Provide periodic rest during spring in alternate years.
- Reduce the risk of water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Claysprings**—nonirrigated—7e; **Badland**—nonirrigated—8s

Range site: **Claysprings**—Clayey Slopes (bouldery) 6-10" p.z.; **Badland**—not assigned

504—Tohona-Kimnoli-Claysprings complex, 2 to 45 percent slopes

Setting

Landform: Cuestas and mesas

Position on the landform: **Tohona**—dipslopes and footslopes; **Kimnoli**—dipslopes, summits, and structural benches; **Claysprings**—scarp faces and backslopes

Slope: **Tohona**—2 to 12 percent; **Kimnoli**—2 to 10 percent; **Claysprings**—35 to 45 percent

Shape of areas: Irregular

Size of areas: 20 to 2,000 acres

Elevation: 4,700 to 5,400 feet

Mean annual precipitation: 6 to 8 inches

Mean annual air temperature: 52 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Tohona very gravelly sandy clay loam and similar soils: 50 percent
 Kimnoli loamy fine sand and similar soils: 20 percent
 Claysprings extremely gravelly sandy clay loam, rubbly and similar soils: 15 percent
 Contrasting inclusions: 15 percent

Contrasting Inclusions

- The very deep Sogzie and Sheppard soils on eolian-mantled areas near the Four Corners Monument and the Utah state line
- Rock outcrop as small sandstone cliffs
- Badland as barren shale slopes
- Kimbeto soils on eolian-mantled summits
- Riverwash in small washes

Characteristics of the Tohona Soil

Typical profile:

- 0 to 1 inch—light brown very gravelly sandy clay loam
- 1 to 11 inches—light reddish brown clay
- 11 to 33 inches—light reddish brown and light gray gypsiferous material which is an apparent silty clay loam
- 33 inches—shale bedrock

Parent material: Alluvium and residuum derived from shale, claystone, and sandstone

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Slow

Available water capacity: Very low to low

Surface runoff: Rapid

Hazard of water erosion: Moderate

Hazard of soil blowing: Severe

Salinity: Moderately saline below a depth of 11 inches

Sodicity: Moderately sodic

Shrink-swell potential: High

Characteristics of the Kimnoli Soil

Typical profile:

- 0 to 4 inches—light brown loamy fine sand
- 4 to 9 inches—light brown fine sandy loam
- 9 inches—sandstone bedrock

Parent material: Eolian material and alluvium derived from sandstone

Depth class: Very shallow

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Very low

Surface runoff: Medium

Hazard of water erosion: Moderate

Hazard of soil blowing: Very severe

Characteristics of the Claysprings Soil

Typical profile:

- 0 to 2 inches—light brown extremely gravelly sandy clay loam
- 2 to 5 inches—light brown and light reddish brown clay
- 5 to 16 inches—pink silty clay
- 16 inches—shale bedrock

Parent material: Colluvium and residuum derived from sandstone, claystone, and shale

Depth class: Shallow

Drainage class: Well drained

Permeability: Very slow

Available water capacity: Very low

Surface runoff: Rapid

Hazard of water erosion: Severe

Hazard of soil blowing: Very slight

Salinity: Slightly saline below a depth of 5 inches

Sodicity: Moderately sodic below a depth of 2 inches

Shrink-swell potential: High

Major Uses

Livestock grazing

Tohona soil

Dominant vegetation in potential plant community: galleta, mound saltbush, alkali sacaton, shadscale, sand dropseed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—300

Unfavorable years—100

Present plant community:

galleta, cheatgrass, sand dropseed, alkali sacaton, mound saltbush, shadscale

Kimnoli soil

Dominant vegetation in potential plant community: galleta, Indian ricegrass, Bigelow sagebrush, alkali sacaton, New Mexico feathergrass, shadscale, broom snakeweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—450

Unfavorable years—250

Present plant community:

Indian ricegrass, galleta, New Mexico feathergrass, Bigelow sagebrush, broom snakeweed, Bigelow rubber rabbitbrush

Claysprings soil

Dominant vegetation in potential plant community: galleta, shadscale, Indian ricegrass, alkali sacaton,

bud sagebrush, bottlebrush squirreltail, mound saltbush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—400

Unfavorable years—200

Present plant community:

galleta, alkali sacaton, cheatgrass, bud sagebrush, shadscale, mound saltbush

Major limitations:

Tohona—hazard of water erosion, hazard of soil blowing, shrink-swell potential

Kimnoli—hazard of soil blowing, depth to bedrock

Claysprings—hazard of water erosion, surface rock fragments, steep slopes, shrink-swell potential

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Uniform distribution of grazing is difficult because of the slope or the lack of permanent water developments, or both.
- Livestock prefer to graze the easily accessible areas before they graze the steep slopes.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Provide periodic rest during spring in alternate years.
- Reduce the risk of water erosion and soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Tohona**—nonirrigated—7c; **Kimnoli**—nonirrigated—7e; **Claysprings**—nonirrigated—7e

Range site: **Tohona**—Clayey Upland (sodic) 6-10" p.z.; **Kimnoli**—Sandstone Upland 6-10" p.z.; **Claysprings**—Clayey Slopes (bouldery) 6-10" p.z.

505—Recapture-Shorthair-Aneth complex, 1 to 8 percent slopes

Setting

Landform: Valley sides

Position on the landform: **Recapture**—fan terraces;

Shorthair—footslopes and structural benches;

Aneth—eolian-mantled fan terraces

Slope: **Recapture**—1 to 5 percent; **Shorthair**—1 to 8 percent; **Aneth**—1 to 8 percent

Shape of areas: Elongated

Size of areas: 20 to 2,000 acres

Elevation: 4,700 to 5,200 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 52 to 56 degrees F

Frost-free period: 140 to 170 days

Composition

Recapture loamy fine sand and similar soils: 45 percent

Shorthair gravelly loamy fine sand and similar soils: 30 percent

Aneth loamy fine sand and similar soils: 15 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- Rock outcrop as small sandstone cliffs and ledges
- Slickspots on water-eroded fan terraces
- Very cobbly sodic soils on stream terraces and fan terraces
- Riverwash in washes

Characteristics of the Recapture Soil

Typical profile:

- 0 to 3 inches—light reddish brown loamy fine sand
- 3 to 17 inches—reddish brown sandy clay loam and fine sandy loam
- 17 to 39 inches—light reddish brown and reddish brown clay loam and sandy clay loam
- 39 to 53 inches—yellowish red fine sandy loam
- 53 to 65 inches—light reddish brown loamy fine sand

Parent material: Alluvium derived from sandstone and shale

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately slow in the subsoil and rapid in the substratum

Available water capacity: Moderate

Surface runoff: Medium

Hazard of water erosion: Moderate

Hazard of soil blowing: Very severe

Salinity: Moderately saline between 30 and 39 inches

Sodicity: Strongly sodic between 17 and 39 inches

Characteristics of the Shorthair Soil

Typical profile:

- 0 to 1 inch—light reddish brown gravelly loamy fine sand

- 1 to 5 inches—reddish brown fine sandy loam
 - 5 to 16 inches—light reddish brown and pink fine sandy loam and loamy fine sand
 - 16 inches—sandstone bedrock
- Parent material:* Alluvium and residuum derived from sandstone
- Depth class:* Shallow
- Drainage class:* Well drained
- Permeability:* Moderate
- Available water capacity:* Very low
- Surface runoff:* Rapid
- Hazard of water erosion:* Slight
- Hazard of soil blowing:* Severe
- Salinity:* Slightly saline below a depth of 5 inches
- Sodicity:* Strongly sodic

Characteristics of the Aneth Soil

Typical profile:

- 0 to 8 inches—reddish brown loamy fine sand
 - 8 to 28 inches—light reddish brown loamy fine sand
 - 28 to 37 inches—light reddish brown fine sandy loam
 - 37 to 65 inches—light reddish brown loamy fine sand and fine sandy loam
- Parent material:* Eolian material and alluvium derived from sandstone and siltstone
- Depth class:* Very deep
- Drainage class:* Somewhat excessively drained
- Permeability:* Moderately rapid
- Available water capacity:* Moderate
- Surface runoff:* Slow
- Hazard of water erosion:* Moderate
- Hazard of soil blowing:* Very severe

Major uses

Livestock grazing

Recapture soil

Dominant vegetation in potential plant community: alkali sacaton, Indian ricegrass, galleta, Drummond goldenweed, broom snakeweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—550

Unfavorable years—350

Present plant community: alkali sacaton, galleta, Indian ricegrass, cheatgrass, broom snakeweed, Drummond goldenweed

Shorthair soil

Dominant vegetation in potential plant community: alkali sacaton, mound saltbush, galleta, shadscale, Indian ricegrass, Drummond goldenweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—350

Unfavorable years—150

Present plant community:

alkali sacaton, galleta, cheatgrass, mound saltbush, shadscale, Drummond goldenweed, broom snakeweed

Aneth soil

Dominant vegetation in potential plant community:

Indian ricegrass, galleta, needleandthread, sand dropseed, sandhill muhly, Cutler Mormon tea, broom snakeweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—700

Unfavorable years—300

Present plant community:

Indian ricegrass, sandhill muhly, sand dropseed, Bigelow rubber rabbitbrush, broom snakeweed

Major limitations:

Recapture—hazard of soil blowing, hazard of water erosion, salinity

Shorthair—hazard of water erosion, hazard of soil blowing, depth to bedrock

Aneth—hazard of soil blowing

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Recapture**—

nonirrigated—7e; **Shorthair**—nonirrigated—7s;

Aneth—nonirrigated—7c

Range site: **Recapture**—Sandy Loam Upland (sodic) 6-10" p.z.; **Shorthair**—Loamy Upland (sodic) 6-10" p.z.; **Aneth**—Sandy Upland 6-10" p.z.

506—Blackston-Grazane association, 3 to 50 percent slopes

Setting

Landform: Fan terraces and high stream terraces

Position on the landform: **Blackston**—treads;
Grazane—risers

Slope: **Blackston**—3 to 8 percent; **Grazane**—20 to 50 percent

Shape of areas: Elongated

Size of areas: 50 to 1,000 acres

Elevation: 4,900 to 5,500 feet

Mean annual precipitation: 6 to 8 inches

Mean annual air temperature: 52 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Blackston fine sandy loam and similar soils: 65 percent

Grazane very cobbly fine sandy loam, very stony and similar soils: 20 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- Rock outcrop exposed as sandstone cliffs and ledges on risers of fan terraces
- The coarse textured Aneth soil on hummocky, eolian-mantled treads of fan terraces
- The moderately fine textured, sodic Recapture soil on treads of fan terraces

Characteristics of the Blackston Soil

Typical profile:

- 0 to 2 inches—reddish brown fine sandy loam
- 2 to 9 inches—yellowish red fine sandy loam
- 9 to 15 inches—yellowish red loam
- 15 to 25 inches—pinkish white gravelly loam
- 25 to 49 inches—brown extremely gravelly loamy sand
- 49 to 66 inches—light brown loamy sand

Parent material: Alluvium derived from sandstone and quartz diorite

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate in the upper layers and rapid in the lower layers

Available water capacity: Low to moderate

Surface runoff: Slow

Hazard of water erosion: Moderate

Hazard of soil blowing: Severe

Salinity: Slightly saline below a depth of 25 inches

Characteristics of the Grazane Soil

Typical profile:

- 0 to 2 inches—reddish brown very cobbly fine sandy loam
- 2 to 6 inches—reddish brown gravelly fine sandy loam

- 6 to 20 inches—reddish brown and light reddish brown sandy clay loam and clay loam

- 20 to 26 inches—reddish brown clay loam

- 26 inches—shale bedrock

Parent material: Alluvium derived from quartz diorite and residuum derived from sandstone and shale

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Moderately slow

Available water capacity: Low

Surface runoff: Rapid

Hazard of water erosion: Very severe

Hazard of soil blowing: Moderate

Salinity: Slightly saline below a depth of 20 inches

Sodicity: Slightly sodic

Major Uses

Livestock grazing

Blackston soil

Dominant vegetation in potential plant community:

Indian ricegrass, galleta, bottlebrush squirreltail, sand dropseed, Cutler Mormon tea, fourwing saltbush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—700

Unfavorable years—350

Present plant community:

galleta, Indian ricegrass, sand dropseed, broom snakeweed

Grazane soil

Dominant vegetation in potential plant community:

galleta, Indian ricegrass, sand dropseed, shadscale, black grama, bottlebrush squirreltail, broom snakeweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—450

Unfavorable years—250

Present plant community:

galleta, Indian ricegrass, sand dropseed, shadscale, broom snakeweed

Major limitations:

Blackston—hazard of soil blowing, hazard of water erosion, subsurface rock fragments

Grazane—steep slopes, surface rock fragments, hazard of soil blowing, hazard of water erosion

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.

- Suitability for range seeding is poor because of climate and soil factors.

- Vary the season of grazing and the periods of rest during successive years.
- Livestock prefer to graze the easily accessible areas before they graze the steep slopes.
- Uniform distribution of grazing is difficult because of the slope or the lack of permanent water developments, or both.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Provide periodic rest during spring in alternate years.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Blackston**—nonirrigated—7c; **Grazane**—nonirrigated—7e
Range site: **Blackston**—Sandy Loam Upland 6-10" p.z.; **Grazane**—Cobbly Slopes 6-10" p.z.

507—Sheppard loamy fine sand, 2 to 8 percent slopes, hummocky

Setting

Landform: Stable dunes on plateaus, mesas, and fan terraces
Shape of areas: Irregular
Size of areas: 100 to 1,000 acres
Elevation: 5,000 to 5,800 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 140 to 160 days

Composition

Sheppard soil and similar soils: 90 percent
 Contrasting inclusions: 10 percent

Contrasting Inclusions

- The moderately coarse textured Sogzie soil on interdune areas
- The moderately fine textured Redlands soil on fan terraces

Typical Profile

- 0 to 3 inches—reddish brown loamy fine sand

- 3 to 70 inches—yellowish red loamy fine sand

Soil Properties and Qualities

Parent material: Eolian material derived from sandstone
Depth class: Very deep
Drainage class: Somewhat excessively drained
Permeability: Rapid
Available water capacity: Low to moderate
Surface runoff: Slow
Hazard of water erosion: Moderate
Hazard of soil blowing: Very severe

Major Uses

Livestock grazing

Dominant vegetation in potential plant community:
 Indian ricegrass, Cutler Mormon tea, galleta, needleandthread, sandhill muhly, spike and sand dropseed, broom snakeweed
Annual production of air-dry vegetation (pounds per acre):
 Favorable years—700
 Unfavorable years—300
Present plant community:
 sandhill muhly, Indian ricegrass, Fendler threeawn, Cutler Mormon tea, broom snakeweed, Bigelow rubber rabbitbrush
Major limitations: hazard of soil blowing, presence of hummocks
Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Provide periodic rest during spring in alternate years.
- Reduce the risk of soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: Nonirrigated—7c
Range site: Sandy Upland 6-10" p.z.

508—Shalet-Rock outcrop complex, 8 to 45 percent slopes

Setting

Landform: Escarpments of mesas

Position on the landform: **Shalet**—footslopes and backslopes; **Rock outcrop**—cliffs, spires, and slickrock

Shape of areas: Elongate

Size of areas: 50 to 500 acres

Elevation: 4,800 to 5,500 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 52 to 56 degrees F

Frost-free period: 140 to 170 days

Composition

Shalet sandy clay loam and similar soils: 55 percent

Rock outcrop: 40 percent

Contrasting inclusions: 5 percent

Contrasting Inclusions

- The more moist Kinusta soil on north aspects
- Badland on barren shale slopes
- The very deep Aneth soils on eolian-mantled structural benches

Characteristics of the Shalet Soil

Typical profile:

- 0 to 3 inches—dark reddish gray with greenish gray sandy clay loam
- 3 to 15 inches—greenish gray with dark reddish gray sandy clay loam
- 15 inches—shale and soft sandstone bedrock

Parent material: Residuum derived from shale and sandstone

Depth class: Shallow

Drainage class: Well drained

Permeability: Moderately slow

Available water capacity: Very low

Surface runoff: Rapid

Hazard of water erosion: Very severe

Hazard of soil blowing: Severe

Salinity: Moderately saline below a depth of 6 inches

Sodicity: Moderately sodic below a depth of 6 inches

Characteristics of Rock outcrop

Rock outcrop consists of exposures of sandstone bedrock. It occurs as cliffs and spires intermixed with the Shalet soil, and as small, isolated areas of slickrock. There is little or no vegetation, and surface runoff is rapid to very rapid.

Major Uses

Livestock grazing

Dominant vegetation in potential plant community: galleta, Indian ricegrass, shadscale, bottlebrush squirreltail, alkali sacaton, Bigelow sagebrush, Torrey Mormon tea, broom snakeweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—500

Unfavorable years—200

Present plant community:

galleta, Indian ricegrass, alkali sacaton, shadscale, Torrey Mormon tea

Major limitations: hazard of water erosion, hazard of soil blowing, steep slopes, presence of rock outcrops

Suitable management practices and considerations:

- Uniform distribution of grazing is difficult because of the slope or the lack of permanent water developments, or both.
- Livestock prefer to graze the easily accessible areas before they graze the steep slopes.
- Suitability for range seeding is poor because of climate and soil factors.
- Control the time and amount of use by livestock.
- Provide periodic rest during spring in alternate years.
- Reduce the risk of water erosion and soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Shalet**—nonirrigated—7e; **Rock outcrop**—nonirrigated—8s

Range site: **Shalet**—Breaks 6-10" p.z.; **Rock outcrop**—not assigned

509—Trail loamy fine sand, 1 to 3 percent slopes

Setting

Landform: Flood plains and alluvial fans

Shape of areas: Long and narrow

Size of areas: 100 to 1,000 acres

Elevation: 5,000 to 5,400 feet

Mean annual precipitation: 6 to 8 inches

Mean annual air temperature: 52 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Trail soil and similar soils: 85 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- Moderately coarse textured soils on flood plains
- The coarse textured Sheppard soil on stable dunes

Typical Profile

- 0 to 5 inches—reddish brown loamy fine sand
- 5 to 27 inches—light brown and light reddish brown stratified fine sand and sand
- 27 to 38 inches—reddish brown and light brown stratified loamy fine sand and silt loam
- 38 to 70 inches—light reddish brown stratified sand and fine sand

Soil Properties and Qualities

Parent material: Alluvium derived from sandstone and siltstone

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Moderately rapid

Available water capacity: Low to moderate

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Very severe

Flooding frequency: Occasional, very brief periods

Major Uses

Livestock grazing

Dominant vegetation in potential plant community:

Indian ricegrass, sand dropseed, galleta, bottlebrush squirreltail, fourwing saltbush, broom snakeweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—750

Unfavorable years—350

Present plant community:

cheatgrass, Russian-thistle, black greasewood, fourwing saltbush, sand dropseed

Major limitations: hazard of soil blowing, flooding

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly

locating watering facilities, properly distributing salt licks, and proper stocking.

- Control the time and amount of use by livestock.
- Provide periodic rest during spring in alternate years.
- Reduce the risk of soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: Nonirrigated—7c

Range site: Sandy terrace 6-10" p.z.

510—Aneth loamy fine sand, 1 to 3 percent slopes

Setting

Landform: Eolian-mantled fan terraces

Shape of areas: Irregular

Size of areas: 100 to 500 acres

Elevation: 5,200 to 5,400 feet

Mean annual precipitation: 6 to 8 inches

Mean annual air temperature: 52 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Aneth soil and similar soils: 80 percent

Contrasting inclusions: 20 percent

Contrasting Inclusions

- The moderately fine textured Redlands soil on fan terraces
- The occasionally flooded Trail soil on flood plains
- The rapidly permeable Sheppard soil on stable dunes

Typical Profile

- 0 to 2 inches—reddish brown loamy fine sand
- 2 to 36 inches—reddish brown loamy fine sand
- 36 to 65 inches—reddish brown fine sandy loam

Soil Properties and Qualities

Parent material: Eolian material and alluvium derived from sandstone

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Moderately rapid

Available water capacity: Moderate

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Very severe

Major Uses

Livestock grazing

Dominant vegetation in potential plant community:

Indian ricegrass, galleta, fourwing saltbush, sand dropseed, bottlebrush squirreltail, winterfat

Annual production of air-dry vegetation (pounds per acre):

Favorable years—750

Unfavorable years—350

Present plant community:

galleta, Indian ricegrass, sand dropseed, cheatgrass, broom snakeweed, Russian-thistle, fourwing saltbush

Major limitations: hazard of soil blowing

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Provide periodic rest during spring in alternate years.
- Reduce the risk of soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: Nonirrigated—7c

Range site: Sandy Terrace 6-10" p.z.

511—Redlands loamy fine sand, 1 to 3 percent slopes

Setting

Landform: Fan terraces

Shape of areas: Irregular

Size of areas: 50 to 1,000 acres

Elevation: 5,000 to 5,900 feet

Mean annual precipitation: 6 to 8 inches

Mean annual air temperature: 52 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Redlands soil and similar soils: 85 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The coarse textured Aneth soil on hummocky, eolian-mantled areas
- The occasionally flooded Trail soil on small alluvial fans
- The moderately coarse textured Sogzie soil throughout the unit
- Redlands soils that have sandy clay loam surfaces on water-eroded areas

Typical Profile

- 0 to 2 inches—reddish brown loamy fine sand
- 2 to 13 inches—yellowish red fine sandy loam
- 13 to 22 inches—reddish brown fine sandy loam
- 22 to 65 inches—reddish brown clay loam and sandy clay loam

Soil Properties and Qualities

Parent material: Alluvium and eolian material derived from sandstone and shale

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: High to very high

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Very severe

Sodicity: Slightly sodic below a depth of 22 inches

Major Uses

Livestock grazing

Dominant vegetation in potential plant community:

galleta, bottlebrush squirreltail, Indian ricegrass, alkali sacaton, fourwing saltbush, winterfat

Annual production of air-dry vegetation (pounds per acre):

Favorable years—700

Unfavorable years—300

Present plant community:

galleta, cheatgrass, broom snakeweed

Major limitations: hazard of soil blowing, hazard of water erosion

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.

- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: Nonirrigated—7c
Range site: Loamy Upland 6-10" p.z.

512—Gotho fine sandy loam, 0 to 2 percent slopes

Setting

Landform: Low stream terraces
Shape of areas: Long and narrow
Size of areas: 50 to 500 acres
Elevation: 4,800 to 5,300 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 140 to 160 days

Composition

Gotho soil and similar soils: 80 percent
 Contrasting inclusions: 20 percent

Contrasting Inclusions

- The fine textured Outpost soil on narrow flood plains
- The coarse textured Sheppard soil on stable dunes
- The somewhat excessively drained Shumbegay soil on hummocks

Typical Profile

- 0 to 2 inches—red fine sandy loam
- 2 to 13 inches—red clay loam and sandy clay loam
- 13 to 57 inches—red sandy clay loam and fine sandy loam
- 57 to 66 inches—reddish brown clay loam

Soil Properties and Qualities

Parent material: Alluvium derived from sandstone, siltstone, and shale
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Available water capacity: Moderate to high
Water intake rate: Moderately rapid
Surface runoff: Slow
Hazard of water erosion: Slight
Hazard of soil blowing: Severe
Flooding frequency: Rare

Salinity: Slightly saline below a depth of 13 inches
Sodicity: Moderately sodic

Major Uses

Livestock grazing
 Irrigated cropland and pasture

Livestock grazing

Dominant vegetation in potential plant community: black greasewood, alkali sacaton, galleta, Indian ricegrass, bottlebrush squirreltail
Annual production of air-dry vegetation (pounds per acre):

Favorable years—800
 Unfavorable years—400

Present plant community: black greasewood, galleta, Russian-thistle, cheatgrass, annual forbs

Major limitations: hazard of soil blowing

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Provide periodic rest during spring in alternate years.
- Reduce the risk of soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Irrigated Cropland and Pasture

Suitable crops: alfalfa, melons, squash, corn, grasses and legumes for pasture

Major limitations: lack of dependable irrigation water, hazard of soil blowing, sodicity, salinity

Suitable management practices and concerns:

- Suitable irrigation systems are furrow, border, and corrugation.
- The salinity and sodicity of the soil limit the kinds of crops that can be grown.
- The concentration of soluble salts and sodium limits the production of some hay and pasture plants.
- A plowpan forms if the soil is excessively cultivated.
- All crops but legumes respond to nitrogen. Legumes respond to phosphorus.
- Use pipes, ditch linings, or drop structures in

irrigation ditches to facilitate irrigation and reduce the risk of ditch erosion.

- Irrigate at a rate that insures optimum production but does not increase deep percolation, runoff, and erosion.
- Maintain tilth by returning crop residue to the soil, using legume mixtures, and using conservation tillage methods.
- Reduce the risk of soil blowing by planting field windbreaks and maintaining a plant cover.
- Grazing when the soil is dry reduces compaction of the surface layer, maintains tilth, and prevents excessive runoff.
- Maintain the quality and quantity of forage by rotating grazing, mowing and clipping, controlling weeds, and fertilizing.

Windbreaks and environmental plantings

- Windbreaks are needed to limit soil losses,

maintain optimum crop yields, protect farm and ranch buildings, and provide cover for wildlife.

- The trees and shrubs selected for planting should be suited to the conditions of the site.
- Irrigation should be provided for the establishment and maintenance of windbreaks.

Interpretive Groups

Land capability classification: Nonirrigated—7c

Range site: Sandy Terrace (sodic) 6-10" p.z.

513—Sogzie-Aneth association, 2 to 8 percent slopes

Setting

Landform: Plateaus, mesas, and cuestas (fig. 12)

Position on the landform: **Sogzie**—summits and



Figure 12.—A typical area of Sogzie-Aneth association, 2 to 8 percent slopes, on Carson Mesa in Arizona. Indian ricegrass is the dominant grass present on these soils when livestock grazing is properly managed. The soils occur in an arid climate zone and are not suitable for range reseeding because the average annual precipitation is very low.

dipslopes; **Aneth**—eolian-mantled summits and toeslopes

Slope: **Sogzie**—2 to 6 percent; **Aneth**—3 to 8 percent

Shape of areas: Irregular

Size of areas: 50 to 1,000 acres

Elevation: 5,100 to 6,000 feet

Mean annual precipitation: 6 to 8 inches

Mean annual air temperature: 52 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Sogzie loamy fine sand and similar soils: 70 percent

Aneth loamy fine sand and similar soils: 20 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- The rapidly permeable Sheppard soil on stable dunes
- The very shallow Kimnoli soil on structural benches
- Rock outcrop of sandstone occurring as slickrock and small ledges
- Moderately fine textured soils which are moderately deep to soft sandstone bedrock

Characteristics of the Sogzie Soil

Typical profile:

- 0 to 4 inches—reddish brown loamy fine sand
- 4 to 14 inches—reddish brown and reddish yellow loamy fine sand
- 14 to 36 inches—reddish yellow and pink fine sandy loam
- 36 to 42 inches—light reddish brown loamy fine sand
- 42 inches—soft sandstone bedrock

Parent material: Eolian material and alluvium derived from sandstone and siltstone

Depth class: Deep

Drainage class: Well drained

Permeability: Moderately rapid

Available water capacity: Low to moderate

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Very severe

Characteristics of the Aneth Soil

Typical profile:

- 0 to 7 inches—yellowish red loamy fine sand
- 7 to 25 inches—yellowish red loamy fine sand
- 25 to 54 inches—light reddish brown, pink, and reddish yellow fine sandy loam
- 54 to 66 inches—reddish yellow loamy fine sand

Parent material: Eolian material and alluvium derived from sandstone and siltstone

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Moderately rapid

Available water capacity: Moderate

Surface runoff: Slow

Hazard of water erosion: Moderate

Hazard of soil blowing: Very severe

Major Uses

Livestock grazing

Sogzie soil

Dominant vegetation in potential plant community:

Indian ricegrass, galleta, sand dropseed, bottlebrush squirreltail, Cutler Mormon tea, narrowleaf yucca

Annual production of air-dry vegetation (pounds per acre):

Favorable years—700

Unfavorable years—350

Present plant community:

galleta, Indian ricegrass, cheatgrass, bottlebrush squirreltail, broom snakeweed, Cutler Mormon tea

Aneth soil

Dominant vegetation in potential plant community:

Indian ricegrass, needleandthread, galleta, sand dropseed, sandhill muhly, Cutler Mormon tea, broom snakeweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—700

Unfavorable years—300

Present plant community:

sandhill muhly, galleta, Indian ricegrass, Fendler threeawn, broom snakeweed, Cutler Mormon tea

Major limitations: hazard of soil blowing

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Provide periodic rest during spring in alternate years.
- Reduce the risk of soil blowing by preventing

overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Sogzie**—nonirrigated—7c; **Aneth**—nonirrigated—7c
Range site: **Sogzie**—Sandy Loam Upland 6-10" p.z.;
Aneth—Sandy Upland 6-10" p.z.

514—Aneth loamy fine sand, 2 to 8 percent slopes, hummocky

Setting

Landform: Eolian-mantled fan terraces, mesas, and cuestas
Shape of areas: Irregular
Size of areas: 100 to 500 acres
Elevation: 5,200 to 5,700 feet
Mean annual precipitation: 5 to 8 inches
Mean annual air temperature: 52 to 56 degrees F
Frost-free period: 140 to 170 days

Composition

Aneth soil and similar soils: 90 percent
 Contrasting inclusions: 10 percent

Contrasting Inclusions

- The moderately coarse textured Sogzie soil on fan terraces
- The rapidly permeable Sheppard soil on stable dunes

Typical Profile

- 0 to 9 inches—yellowish red loamy fine sand
- 9 to 33 inches—yellowish red loamy fine sand
- 33 to 51 inches—reddish yellow fine sandy loam
- 51 to 70 inches—reddish yellow loamy fine sand

Soil Properties and Qualities

Parent material: Eolian material and alluvium derived from sandstone and siltstone
Depth class: Very deep
Drainage class: Somewhat excessively drained
Permeability: Moderately rapid
Available water capacity: Moderate
Surface runoff: Slow
Hazard of water erosion: Moderate
Hazard of soil blowing: Very severe

Major Uses

Livestock grazing

Dominant vegetation in potential plant community:
 Indian ricegrass, needleandthread, galleta, sand dropseed, sandhill muhly, Cutler Mormon tea, broom snakeweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—700

Unfavorable years—300

Present plant community:

sandhill muhly, Indian ricegrass, Fendler threeawn, sand dropseed, Cutler Mormon tea, Bigelow rubber rabbitbrush, broom snakeweed

Major limitations: hazard of soil blowing, presence of hummocks

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Provide periodic rest during spring in alternate years.
- Reduce the risk of soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: Nonirrigated—7c
Range site: Sandy Upland 6-10" p.z.

515—Piute-Bluechief-Rock outcrop complex, 2 to 25 percent slopes

Setting

Landform: Structural benches

Position on the landform: **Piute**—summits;

Bluechief—eolian-mantled summits; **Rock outcrop**—summits

Slope: **Piute**—2 to 25 percent; **Bluechief**—2 to 5 percent

Shape of areas: Irregular

Size of areas: 100 to 1,000 acres

Elevation: 4,800 to 5,600 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 54 to 56 degrees F

Frost-free period: 150 to 170 days

Composition

Piute gravelly loamy fine sand and similar soils: 45 percent

Bluechief loamy fine sand and similar soils: 25 percent

Rock outcrop: 20 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- The shallow Pennell soil on summits of small mesas
- The moderately fine textured Shalet soil on backslopes between structural benches
- The very deep Sheppard soil on stable dunes

Characteristics of the Piute Soil

Typical profile:

- 0 to 3 inches—yellowish red gravelly loamy fine sand
- 3 to 7 inches—light reddish brown fine sand
- 7 inches—sandstone bedrock

Parent material: Eolian material and residuum derived from sandstone

Depth class: Very shallow

Drainage class: Well drained

Permeability: Rapid

Available water capacity: Very low

Surface runoff: Rapid

Hazard of water erosion: Moderate

Hazard of soil blowing: Severe

Characteristics of the Bluechief Soil

Typical profile:

- 0 to 5 inches—reddish yellow loamy fine sand
- 5 to 11 inches—yellowish red very fine sandy loam
- 11 to 22 inches—reddish yellow fine sandy loam
- 22 to 29 inches—pink fine sandy loam
- 29 inches—sandstone bedrock

Parent material: Eolian material, alluvium, and residuum derived from sandstone

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Moderately rapid

Available water capacity: Low

Surface runoff: Medium

Hazard of water erosion: Moderate

Hazard of soil blowing: Very severe

Characteristics of Rock outcrop

Rock outcrop consists of exposed sandstone bedrock occurring as small areas of slickrock or as short, irregular ledges. It is intermingled with the Piute soil. There is little or no vegetation, and surface runoff is rapid.

Major Uses

Livestock grazing

Piute soil

Dominant vegetation in potential plant community: blackbrush, Indian ricegrass, galleta, New Mexico feathergrass, black grama, Bigelow sagebrush, Torrey Mormon tea, Eastwood sandwort, narrowleaf yucca

Annual production of air-dry vegetation (pounds per acre):

Favorable years—450

Unfavorable years—150

Present plant community:

blackbrush, Bigelow sagebrush, Torrey Mormon tea, Indian ricegrass, galleta

Bluechief soil

Dominant vegetation in potential plant community: blackbrush, Indian ricegrass, galleta, sand dropseed, Cutler Mormon tea

Annual production of air-dry vegetation (pounds per acre):

Favorable years—550

Unfavorable years—350

Present plant community:

blackbrush, Cutler Mormon tea, Indian ricegrass, sandhill muhly, galleta

Major limitations:

Piute—hazard of water erosion, hazard of soil blowing, depth to bedrock

Bluechief—hazard of soil blowing, hazard of water erosion

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Uniform distribution of grazing is difficult because of the slope or the lack of permanent water developments, or both.
- Promote uniform grazing by fencing, properly

locating watering facilities, properly distributing salt licks, and proper stocking.

- Control the time and amount of use by livestock.
- Provide periodic rest during spring in alternate years.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Piute**—nonirrigated—7s; **Bluechief**—nonirrigated—7c; **Rock outcrop**—nonirrigated—8s

Range site: **Piute**—Sandstone Upland (calcareous) 6-10" p.z.; **Bluechief**—Sandy Loam Upland (calcareous) 6-10" p.z.; **Rock outcrop**—not assigned

516—Kaito-Claysprings complex, 30 to 65 percent slopes

Setting

Landform: Hills

Position on the landform: **Kaito**—alluvial cones;

Claysprings—backslopes

Slope: **Kaito**—30 to 50 percent; **Claysprings**—50 to 65 percent

Shape of areas: Irregular

Size of areas: 100 to 1,000 acres

Elevation: 5,300 to 6,000 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 54 to 56 degrees F

Frost-free period: 150 to 170 days

Composition

Kaito extremely gravelly fine sandy loam, extremely stony and similar soils: 50 percent

Claysprings extremely gravelly sandy clay loam, rubbly and similar soils: 35 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The moderately fine textured Shalet soil on backslopes
- The sodic Tohona soil on summits and shoulders of hills
- Rock outcrop of sandstone occurring as short cliffs

Characteristics of the Kaito Soil

Typical profile:

- 0 to 3 inches—reddish brown extremely gravelly fine sandy loam
- 3 to 10 inches—reddish brown gravelly fine sandy loam
- 10 to 24 inches—pink very fine sandy loam
- 24 to 47 inches—light reddish brown fine sandy loam
- 47 inches—soft sandstone bedrock

Parent material: Alluvium and residuum derived from sandstone, siltstone, and conglomerate

Depth class: Deep

Drainage class: Well drained

Permeability: Moderately rapid

Available water capacity: Moderate to high

Surface runoff: Rapid

Hazard of water erosion: Severe

Hazard of soil blowing: Very slight

Characteristics of the Claysprings Soil

Typical profile:

- 0 to 2 inches—reddish brown extremely gravelly sandy clay loam
- 2 to 16 inches—reddish brown clay
- 16 inches—shale bedrock

Parent material: Colluvium and residuum derived from sandstone, shale, and conglomerate

Depth class: Shallow

Drainage class: Well drained

Permeability: Very slow

Available water capacity: Very low

Surface runoff: Rapid

Hazard of water erosion: Severe

Hazard of soil blowing: Very slight

Salinity: Moderately saline below a depth of 5 inches

Sodicity: Moderately sodic

Shrink-swell potential: High

Major Uses

Livestock grazing

Kaito soil

Dominant vegetation in potential plant community: blackbrush, Indian ricegrass, galleta, bottlebrush squirreltail, shadscale, Torrey Mormon tea

Annual production of air-dry vegetation (pounds per acre):

Favorable years—500

Unfavorable years—200

Present plant community:

blackbrush, Indian ricegrass, galleta, shadscale

Claysprings soil

Dominant vegetation in potential plant community:

galleta, shadscale, Indian ricegrass, alkali sacaton,
bud sagebrush, bottlebrush squirreltail, mound
saltbush

*Annual production of air-dry vegetation (pounds per
acre):*

Favorable years—400

Unfavorable years—200

Present plant community:

galleta, shadscale, bud sagebrush, Indian ricegrass,
Torrey Mormon tea

Major limitations:

Kaito—hazard of water erosion, steep slopes,
surface rock fragments

Claysprings—hazard of water erosion, steep slopes,
surface rock fragments, shrink-swell potential

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Uniform distribution of grazing is difficult because of the slope or the lack of permanent water developments, or both.
- Livestock prefer to graze the easily accessible areas before they graze the steep slopes.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Provide periodic rest during spring in alternate years.
- Reduce the risk of water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Kaito**—nonirrigated—7e; **Claysprings**—nonirrigated—7e

Range site: **Kaito**—Stony Slopes (calcareous) 6-10" p.z.; **Claysprings**—Clayey Slopes (bouldery) 6-10" p.z.

517—Moffat loamy fine sand, 1 to 12 percent slopes

Setting

Landform: Fan terraces

Shape of areas: Irregular

Size of areas: 50 to 1,500 acres

Elevation: 4,900 to 5,600 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 54 to 56 degrees F

Frost-free period: 150 to 170 days

Composition

Moffat soil and similar soils: 80 percent

Contrasting inclusions: 20 percent

Contrasting Inclusions

- The coarse textured Aneth soil on hummocky areas
- A shallow soil over an indurated calcium carbonate pan on summits of the Nokaito Bench

Typical Profile

- 0 to 6 inches—yellowish red loamy fine sand
- 6 to 28 inches—reddish yellow fine sandy loam
- 28 to 47 inches—pink and white fine sandy loam
- 47 to 65 inches—pink and light reddish brown fine sandy loam

Soil Properties and Qualities

Parent material: Alluvium and eolian material derived from sandstone and siltstone

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately rapid

Available water capacity: High

Surface runoff: Slow

Hazard of water erosion: Moderate

Hazard of soil blowing: Very severe

Sodicity: Slightly sodic below a depth of 47 inches

Major Uses

Livestock grazing

Dominant vegetation in potential plant community:

blackbrush, Indian ricegrass, galleta, sand dropseed,
needleandthread, Cutler Mormon tea

*Annual production of air-dry vegetation (pounds per
acre):*

Favorable years—550

Unfavorable years—350

Present plant community:

blackbrush, Indian ricegrass, galleta, Cutler Mormon tea

Major limitations: hazard of soil blowing

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: Nonirrigated—7c

Range site: Sandy Loam Upland (calcareous) 6-10" p.z.

518—Tohatin-Sheppard loamy fine sands, 5 to 35 percent slopes

Setting

Landform: Dissected fan terraces

Position on the landform: **Tohatin**—treads and risers;

Sheppard—stable dunes on treads and risers

Slope: **Tohatin**—5 to 35 percent; **Sheppard**—5 to 30 percent

Shape of areas: Irregular

Size of areas: 20 to 2,000 acres

Elevation: 4,900 to 5,800 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 54 to 56 degrees F

Frost-free period: 150 to 170 days

Composition

Tohatin soil and similar soils: 50 percent

Sheppard soil and similar soils: 35 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The shallow Shalet soil on backslopes
- The deep, moderately coarse textured Kaito soil on stony areas

- The stratified Trail soil on narrow flood plains
- Rock outcrop of sandstone occurring as small ledges

Characteristics of the Tohatin Soil

Typical profile:

- 0 to 3 inches—light reddish brown loamy fine sand
- 3 to 48 inches—reddish yellow and light reddish brown loamy fine sand
- 48 to 80 inches—reddish yellow fine sandy loam and loamy fine sand

Parent material: Alluvium and eolian material derived from sandstone

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Moderately rapid

Available water capacity: Low to moderate

Surface runoff: Medium

Hazard of water erosion: Very severe

Hazard of soil blowing: Very severe

Characteristics of the Sheppard Soil

Typical profile:

- 0 to 8 inches—yellowish red loamy fine sand
- 8 to 80 inches—yellowish red loamy fine sand

Parent material: Eolian material derived from sandstone

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Rapid

Available water capacity: Low to moderate

Surface runoff: Medium

Hazard of water erosion: Severe

Hazard of soil blowing: Very severe

Major Uses

Livestock grazing

Tohatin soil

Dominant vegetation in potential plant community: blackbrush, Indian ricegrass, galleta, sand dropseed, sandhill muhly, Cutler Mormon tea

Annual production of air-dry vegetation (pounds per acre):

Favorable years—550

Unfavorable years—350

Present plant community:

blackbrush, galleta, Indian ricegrass, sandhill muhly, Cutler Mormon tea (fig. 13)

Sheppard soil

Dominant vegetation in potential plant community:

Indian ricegrass, galleta, Cutler Mormon tea, needleandthread, sandhill muhly, spike and sand dropseed



Figure 13.—A typical area of of Tohatin-Sheppard loamy fine sands, 5 to 35 percent slopes. Blackbrush is the dark shrub present on the Tohatin soil, and Cutler Mormon tea is the dominant shrub on the hummocky Sheppard soil. Kaito-Claysprings complex, 30 to 65 percent slopes, is on the steep hills below Toh Atin Mesa in the background.

Annual production of air-dry vegetation (pounds per acre):

Favorable years—700

Unfavorable years—300

Present plant community:

sandhill muhly, Fendler threeawn, Cutler Mormon tea, broom snakeweed

Major limitations: hazard of soil blowing, hazard of water erosion

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Uniform distribution of grazing is difficult because

of the slope or the lack of permanent water developments, or both.

- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Tohatin**—nonirrigated—7c; **Sheppard**—nonirrigated—7c

Range site: **Tohatin**—Sandy Loam Upland (calcareous) 6-10" p.z.; **Sheppard**—Sandy Upland 6-10" p.z.

519—Shumbegay loamy fine sand, 0 to 8 percent slopes

Setting

Landform: Hummocks and stable dunes of low stream terraces

Shape of areas: Elongate

Size of areas: 20 to 500 acres

Elevation: 4,700 to 5,800 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 52 to 56 degrees F

Frost-free period: 140 to 170 days

Composition

Shumbegay soil and similar soils: 85 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The occasionally flooded Trail soil on narrow flood plains and alluvial fans
- The moderately fine textured Gotho soil on interdune areas
- The nonsodic Sheppard soil on stable dunes southwest of Totacon
- Duneland on unstable, barren sand dunes southwest of the Dancing Rocks in the Chinle Valley

Typical Profile

- 0 to 2 inches—light reddish brown loamy fine sand
- 2 to 6 inches—red loamy fine sand
- 6 to 10 inches—reddish yellow loamy fine sand
- 10 to 80 inches—reddish yellow stratified fine sand and loamy fine sand with lenses of very fine sandy loam and silt loam

Soil Properties and Qualities

Parent material: Eolian material and alluvium derived from sandstone and siltstone

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Moderately rapid

Available water capacity: Moderate

Surface runoff: Medium

Hazard of water erosion: Moderate

Hazard of soil blowing: Very severe

Sodicity: Moderately sodic between 2 and 37 inches

Major Uses

Livestock grazing

Dominant vegetation in potential plant community: black greasewood, alkali sacaton, bottlebrush squirreltail, Indian ricegrass, galleta, sand dropseed, Torrey seapweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—800

Unfavorable years—400

Present plant community:

black greasewood, Torrey seapweed, broom snakeweed, sand dropseed, Russian-thistle

Major limitations: hazard of soil blowing, hazard of water erosion

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: Nonirrigated—7c

Range site: Sandy Terrace (sodic) 6-10" p.z.

520—Rock outcrop-Needle complex, 2 to 20 percent slopes

Setting

Landform: Structural benches

Position on the landform: **Rock outcrop**—summits;

Needle—eolian-mantled summits

Shape of areas: Irregular

Size of areas: 20 to 3,000 acres

Elevation: 4,700 to 5,500 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 54 to 56 degrees F

Frost-free period: 150 to 170 days

Composition

Rock outcrop: 75 percent
Needle fine sand and similar soils: 20 percent
Contrasting inclusions: 5 percent

Contrasting Inclusions

- The very deep Sheppard soil on stable dunes
- The well drained Pennell soil on mesas and structural benches

Characteristics of Rock outcrop

Rock outcrop consists of exposures of sandstone bedrock. It occurs as large areas of gently to moderately sloping slickrock intermingled with small bodies of Needle soil, and as steeply sloping to vertical cliffs. There is little or no vegetation, and surface runoff is rapid to very rapid.

Characteristics of the Needle Soil

Typical profile:

- 0 to 5 inches—reddish yellow fine sand
- 5 to 15 inches—reddish yellow and yellowish red fine sand
- 15 inches—sandstone bedrock

Parent material: Eolian material derived from sandstone

Depth class: Shallow

Drainage class: Excessively drained

Permeability: Rapid

Available water capacity: Very low

Surface runoff: Medium

Hazard of water erosion: Moderate

Hazard of soil blowing: Very severe

Major Uses

Livestock grazing

Needle soil

Dominant vegetation in potential plant community: blackbrush, wavyleaf oak, Indian ricegrass, galleta, muttongrass, sideoats grama, needleandthread, singleleaf ash, broom snakeweed, Utah serviceberry

Annual production of air-dry vegetation (pounds per acre):

Favorable years—450

Unfavorable years—150

Present plant community:

blackbrush, wavyleaf oak, Indian ricegrass, galleta, sandhill muhly, broom snakeweed

Major limitations: presence of substantial amounts of rock outcrop on intricate slopes, depth to bedrock, hazard of soil blowing, hazard of water erosion

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Uniform distribution of grazing is difficult because of the Rock outcrop or the lack of permanent water developments, or both.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Rock outcrop**—nonirrigated—8s; **Needle**—nonirrigated—7s

Range site: **Rock outcrop**—not assigned; **Needle**—Sandstone Upland (calcareous) 5-8" p.z.

521—Sandbench-Sheppard fine sands, 1 to 8 percent slopes

Setting

Landform: Structural benches

Position on the landform: **Sandbench**—eolian-mantled summits; **Sheppard**—stable dunes

Slope: **Sandbench**—1 to 5 percent; **Sheppard**—2 to 8 percent

Shape of areas: Irregular

Size of areas: 200 to 3,000 acres

Elevation: 4,800 to 5,600 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 52 to 56 degrees F

Frost-free period: 140 to 170 days

Composition

Sandbench soil and similar soils: 50 percent

Sheppard soil and similar soils: 40 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- The shallow Needle soil on eolian-mantled structural benches
- The very shallow Piute soil on structural benches
- The sodic, moderately coarse textured Tyende soil on structural benches

- Rock outcrop of sandstone occurring as areas of slickrock

Characteristics of the Sandbench Soil

Typical profile:

- 0 to 11 inches—yellowish red fine sand
- 11 to 17 inches—yellowish red loamy fine sand
- 17 to 31 inches—pink and reddish yellow loamy fine sand
- 31 inches—sandstone bedrock

Parent material: Eolian material and residuum derived from sandstone

Depth class: Moderately deep

Drainage class: Somewhat excessively drained

Permeability: Rapid

Available water capacity: Very low

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Very severe

Characteristics of the Sheppard Soil

Typical profile:

- 0 to 4 inches—yellowish red fine sand
- 4 to 61 inches—yellowish red and reddish yellow fine sand and loamy fine sand

Parent material: Eolian material derived from sandstone

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Rapid

Available water capacity: Low to moderate

Surface runoff: Slow

Hazard of water erosion: Moderate

Hazard of soil blowing: Very severe

Major Uses

Livestock grazing

Sandbench soil

Dominant vegetation in potential plant community:

Indian ricegrass, galleta, needleandthread, spike and sand dropseed, sandhill muhly, Cutler Mormon tea, gray horsebrush, broom snakeweed, Bigelow rubber rabbitbrush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—700

Unfavorable years—300

Present plant community:

sandhill muhly, Indian ricegrass, gray horsebrush, Bigelow rubber rabbitbrush

Sheppard soil

Dominant vegetation in potential plant community:

Indian ricegrass, Cutler Mormon tea, galleta, needleandthread, spike and sand dropseed, broom snakeweed, Bigelow rubber rabbitbrush
Annual production of air-dry vegetation (pounds per acre):

Favorable years—700

Unfavorable years—300

Present plant community:

sandhill muhly, Indian ricegrass, Bigelow rubber rabbitbrush, Cutler Mormon tea, broom snakeweed

Major limitations: hazard of soil blowing

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Provide periodic rest during spring in alternate years.
- Reduce the risk of soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Sandbench**—

nonirrigated—7c; **Sheppard**—nonirrigated—7c

Range site: **Sandbench**—Sandy upland 6-120" p.z.;

Sheppard—Sandy upland 6-10" p.z.

522—Pennell loamy fine sand, 1 to 6 percent slopes

Setting

Landform: Summits of mesas and structural benches

Shape of areas: Irregular to oblong

Size of areas: 20 to 500 acres

Elevation: 5,000 to 5,500 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 54 to 56 degrees F

Frost-free period: 150 to 170 days

Composition

Pennell soil and similar soils: 80 percent

Contrasting inclusions: 20 percent

Contrasting Inclusions

- The very deep, coarse textured Sheppard soil on stable dunes
- The very shallow Piute soil on structural benches

Typical Profile

- 0 to 5 inches—yellowish red loamy fine sand
- 5 to 10 inches—reddish yellow fine sandy loam
- 10 to 18 inches—pink and pinkish white gravelly sandy loam and gravelly loam
- 18 inches—limestone bedrock

Soil Properties and Qualities

Parent material: Eolian material derived from sandstone and residuum derived from limestone

Depth class: Shallow

Drainage class: Well drained

Permeability: Moderately rapid

Available water capacity: Very low

Surface runoff: Slow

Hazard of water erosion: Moderate

Hazard of soil blowing: Very severe

Major Uses

Livestock grazing

Dominant vegetation in potential plant community: blackbrush, Indian ricegrass, galleta, Cutler Mormon tea, broom snakeweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—450

Unfavorable years—250

Present plant community:

blackbrush, broom snakeweed, Cutler Mormon tea, Indian ricegrass, galleta

Major limitations: Hazard of soil blowing, depth to bedrock

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: Nonirrigated—7s

Range site: Shallow Sandy Loam (calcareous) 6-10" p.z.

523—Tyende-Aneth-Shumbegay loamy fine sands, 1 to 25 percent slopes

Setting

Landform: Structural benches

Position on the landform: **Tyende**—summits; **Aneth**—eolian-mantled summits; **Shumbegay**—stable dunes

Slope: **Tyende**—1 to 3 percent; **Aneth**—2 to 8 percent; **Shumbegay**—10 to 25 percent

Shape of areas: Irregular

Size of areas: 100 to 1000 acres

Elevation: 5,000 to 5,500 feet

Mean annual precipitation: 6 to 8 inches

Mean annual air temperature: 52 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Tyende soil and similar soils: 50 percent

Aneth soil and similar soils: 25 percent

Shumbegay soil and similar soils: 15 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- The very shallow Piute, cool soil on structural benches
- Rock outcrop of sandstone occurring as small areas of slickrock

Characteristics of the Tyende Soil

Typical profile:

- 0 to 6 inches—yellowish red loamy fine sand
- 6 to 10 inches—red fine sandy loam
- 10 to 14 inches—light red sandy clay loam
- 14 to 28 inches—light red and light reddish brown very fine sandy loam
- 28 to 37 inches—light reddish brown fine sandy loam
- 37 inches—soft sandstone bedrock

Parent material: Eolian material, alluvium, and residuum derived from sandstone and siltstone

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Very low

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Very severe

Salinity: Strongly saline between 14 and 28 inches

Sodicity: Strongly sodic below a depth of 6 inches

Characteristics of the Aneth Soil

Typical profile:

- 0 to 2 inches—reddish yellow loamy fine sand
- 2 to 32 inches—reddish yellow loamy fine sand
- 32 to 63 inches—pink and reddish yellow fine sandy loam and very fine sandy loam

Parent material: Eolian material derived from sandstone

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Moderately rapid

Available water capacity: Moderate

Surface runoff: Slow

Hazard of water erosion: Moderate

Hazard of soil blowing: Very severe

Characteristics of the Shumbegay Soil

Typical profile:

- 0 to 1 inch—reddish yellow loamy fine sand
- 1 to 5 inches—red loamy fine sand
- 5 to 80 inches—reddish yellow loamy fine sand

Parent material: Eolian material derived from sandstone

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Moderately rapid

Available water capacity: Low to moderate

Surface runoff: Medium

Hazard of water erosion: Severe

Hazard of soil blowing: Very severe

Sodicity: Moderately sodic between 1 inch and 5 inches

Major Uses

Livestock grazing

Tyende soil

Dominant vegetation in potential plant community: alkali sacaton, Indian ricegrass, galleta, shadscale, Drummond goldenweed, broom snakeweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—550

Unfavorable years—350

Present plant community:

alkali sacaton, galleta, Indian ricegrass, Drummond goldenweed, broom snakeweed

Aneth soil

Dominant vegetation in potential plant community: Indian ricegrass, galleta, needleandthread, sand

dropseed, sandhill muhly, Cutler Mormon tea, broom snakeweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—700

Unfavorable years—300

Present plant community:

sandhill muhly, Indian ricegrass, galleta, Cutler Mormon tea, Bigelow rubber rabbitbrush

Shumbegay soil

Dominant vegetation in potential plant community:

black greasewood, alkali sacaton, bottlebrush squirreltail, Indian ricegrass, galleta, sand dropseed, Torrey seapweed

Annual production of air-dry vegetation (pounds per acre):

Favorable years—800

Unfavorable years—400

Present plant community:

black greasewood, alkali sacaton, Indian ricegrass, annual forbs

Major limitations: hazard of soil blowing, hazard of water erosion

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Control the time and amount of use by livestock.
- Provide periodic rest during spring in alternate years.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Tyende**—nonirrigated—7s; **Aneth**—nonirrigated—7c; **Shumbegay**—nonirrigated—7c

Range site: **Tyende**—Sandy Loam Upland 6-10" p.z.; **Aneth**—Sandy Upland 6-10" p.z.; **Shumbegay**—Sandy Terrace (sodic) 6-10" p.z.

524—Uzaneva clay loam, 0 to 2 percent slopes

Setting

Landform: Low stream terraces

Shape of areas: Elongate to irregular

Size of areas: 20 to 1,000 acres

Elevation: 4,700 to 5,200 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 52 to 56 degrees F

Frost-free period: 140 to 170 days

Composition

Uzaneva soil and similar soils: 85 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The sodic, coarse textured Shumbegay soil on stable dunes
- The moderately fine textured Gotho soil on hummocks
- The occasionally flooded Trail soil on small alluvial fans
- Slickspots on barren flats
- Gullied land along drainage channels

Typical Profile

- 0 to 1 inch—reddish brown clay loam
- 1 to 13 inches—reddish brown clay
- 13 to 25 inches—light reddish brown silty clay loam
- 25 to 80 inches—reddish brown and light reddish brown stratified sandy loam to silty clay

Soil Properties and Qualities

Parent material: Alluvium derived from shale, siltstone, and sandstone

Depth class: Very deep

Drainage class: Well drained

Permeability: Very slow

Available water capacity: Very high

Water intake rate: Slow

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Severe

Flooding frequency: Rare

Salinity: Very slightly saline below a depth of 13 inches

Sodicity: Moderately sodic below a depth of 13 inches

Corrosion potential: High for steel, moderate for concrete

Shrink-swell potential: High

Major Uses

Livestock grazing

Irrigated cropland and pasture

Urban development

Livestock grazing

Dominant vegetation in potential plant community:

mound saltbush, alkali sacaton, galleta, bottlebrush squirreltail, Torrey seapweed, black greasewood (fig. 14)

Annual production of air-dry vegetation (pounds per acre):

Favorable years—650

Unfavorable years—450

Present plant community:

mound saltbush, black greasewood, Russian-thistle, annual forbs

Major limitations: hazard of soil blowing, shrink-swell potential

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Control the time and amount of use by livestock.
- Provide periodic rest during spring in alternate years.
- Reduce the risk of soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Irrigated cropland and pasture

Suitable crops: alfalfa, corn, grasses and legumes for pasture

Major limitations: lack of dependable irrigation water, hazard of soil blowing, slow water intake rate, slow permeability, sodicity, soil piping

Suitable management practices and concerns:

- Suitable irrigation systems are furrow, border, and corrugation.
- Use pipes, ditch linings, or drop structures in irrigation ditches to facilitate irrigation and reduce the risk of ditch erosion and soil piping.
- Irrigate at a rate that insures optimum production but does not increase soil piping, runoff, and erosion.
- All crops but legumes respond to nitrogen. Legumes respond to phosphorus.
- Maintain tilth by returning crop residue to the soil, using legume mixtures, and using conservation tillage methods.
- Reduce the risk of soil blowing by planting field windbreaks and maintaining a plant cover.
- Grazing when the soil is dry reduces compaction of the surface layer, maintains tilth, and prevents excessive runoff.
- Maintain the quality and quantity of forage by rotating grazing, mowing and clipping, controlling weeds, and fertilizing.



Figure 14.—A broad area of Uzaneva clay loam, 0 to 2 percent slopes, in the Chinle Valley south of Rock Point, Arizona. Mound saltbush is the dominant plant growing on this sodic soil. Rock outcrop within map unit 525 is on the escarpment of Carson Mesa in the background.

Urban development

Major limitations: very slow permeability, rare flooding, shrink-swell potential, corrosivity, soil blowing

Suitable management practices and concerns:

- Excavation can expose soil material that is highly susceptible to blowing.
- Excavation increases the risk of water erosion.
- The quality of roadbeds and road surfaces can be adversely affected by shrinking and swelling.
- Septic tank absorption fields will function poorly because of the slow permeability of the soil.
- Reduce the hazard of flooding by locating structures above the expected flood level and away from washes.
- Prevent structural damage that results from shrinking and swelling by designing foundations and footings to allow for shrinking and swelling and by diverting runoff away from buildings.

- Offset the risk of corrosion to uncoated steel and concrete by using corrosion-resistant material for foundation, basements, and underground utilities.
- Increase the size of the absorption area to compensate for the slow soil permeability.
- Provide an adequate wearing surface on roads to reduce the amount of dust and lower maintenance cost.
- Install culverts to carry seasonal runoff where roads cross natural drainageways.

Windbreaks and environmental plantings

- Windbreaks are needed to limit soil losses, maintain optimum crop yields, protect farm and ranch buildings, and provide cover for wildlife.
- The trees and shrubs selected for planting should be suited to the conditions of the site.
- Irrigation should be provided for the establishment and maintenance of windbreaks.

Interpretive Groups

Land capability classification: Nonirrigated—7c; irrigated—3s

Range site: Clay Loam Terrace (sodic) 6-10" p.z.

525—Rock outcrop

Setting

Landform: Escarpments of mesas and plateaus

Shape of areas: Irregular to elongated

Size of areas: 50 to 5,000 acres

Elevation: 5,000 to 5,700 feet

Mean annual precipitation: 6 to 8 inches

Mean annual air temperature: 52 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Rock outcrop: 90 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- The very shallow Piute, cool soil in small soil pockets on structural benches
- Loamy soils shallow to limestone bedrock on small mesas and on structural benches
- The very deep Trail soil on small alluvial fans
- Rubble land, Badland, and the moderately fine textured Shalet soil on footslopes at the base of Carson Mesa and No Trail Mesa

Characteristics of Rock outcrop

Rock outcrop consists of exposures of sandstone bedrock. It occurs as gently to moderately sloping slickrock, and as steeply sloping to vertical cliffs and spires. There is little or no vegetation, and surface runoff is rapid to very rapid.

Major Uses

Wildlife habitat

- Rock outcrop is important for many birds and bats. The cliffs provide nest and roost sites, hunting perches, and safety from danger for several raptor species. The intricately carved areas of slickrock provide resting cover, den areas, and safety from danger for other wildlife species.
- Seeps occur in places along vertical or overhanging sandstone cliffs, where ground water emerges at contacts with impermeable strata. These seep zones support natural, hanging gardens for

plant species requiring constant moisture, and also supply small amounts of water for wildlife.

Interpretive Groups

Land capability classification: Nonirrigated—8s

Range site: Not assigned

526—Sandbench-Rock outcrop-Piute, cool complex, 1 to 8 percent slopes

Setting

Landform: Structural benches

Position on the landform: **Sandbench**—eolian-mantled summits; **Rock outcrop**—summits; **Piute, cool**—summits

Slope: **Sandbench**—1 to 8 percent; **Piute, cool**—1 to 8 percent

Shape of areas: Irregular

Size of areas: 50 to 1,000 acres

Elevation: 5,000 to 6,000 feet

Mean annual precipitation: 6 to 8 inches

Mean annual air temperature: 52 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Sandbench fine sand and similar soils: 45 percent

Rock outcrop: 25 percent

Piute, cool gravelly loamy fine sand and similar soils: 20 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- The very deep Sheppard soil on stable dunes
- The deep phase of the moderately coarse textured Sogzie soil on footslopes
- The strongly sodic Tyende soil on summits of structural benches

Characteristics of the Sandbench Soil

Typical profile:

- 0 to 8 inches—reddish yellow fine sand
- 8 to 19 inches—reddish yellow loamy fine sand
- 19 to 37 inches—reddish yellow loamy fine sand
- 37 inches—sandstone bedrock

Parent material: Eolian material and residuum derived from sandstone

Depth class: Moderately deep

Drainage class: Somewhat excessively drained

Permeability: Rapid

Available water capacity: Very low

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Very severe

Characteristics of Rock outcrop

Rock outcrop consists of exposures of sandstone bedrock. It occurs as gently to moderately sloping slickrock and in places is intermingled with the Piute soil. There is little or no vegetation, and surface runoff is rapid to very rapid.

Characteristics of the Piute, cool Soil

Typical profile:

- 0 to 3 inches—reddish yellow gravelly loamy fine sand
- 3 to 8 inches—reddish yellow fine sand
- 8 inches—sandstone bedrock

Parent material: Eolian material and residuum derived from sandstone

Depth class: Very shallow

Drainage class: Well drained

Permeability: Rapid

Available water capacity: Very low

Surface runoff: Rapid

Hazard of water erosion: Slight

Hazard of soil blowing: Severe

Major Uses

Livestock grazing

Sandbench soil

Dominant vegetation in potential plant community:

Indian ricegrass, galleta, needleandthread, spike and sand dropseed, sandhill muhly, Cutler Mormon tea, broom snakeweed, Bigelow rubber rabbitbrush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—700

Unfavorable years—300

Present plant community:

sandhill muhly, Indian ricegrass, galleta, Bigelow rubber rabbitbrush, Cutler Mormon tea, broom snakeweed

Piute, cool soil

Dominant vegetation in potential plant community:

Indian ricegrass, galleta, needleandthread, black grama, Bigelow sagebrush, blue grama, broom snakeweed, Eastwood sandwort

Annual production of air-dry vegetation (pounds per acre):

Favorable years—450

Unfavorable years—250

Present plant community:

sandhill muhly, Indian ricegrass, needleandthread, galleta, blue grama, broom snakeweed, Bigelow sagebrush

Major limitations:

Sandbench—hazard of soil blowing;

Piute, cool—hazard of water erosion, hazard of soil blowing, depth to bedrock

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate and soil factors.
- Vary the season of grazing and the periods of rest during successive years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Provide periodic rest during spring in alternate years.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: **Sandbench**—

nonirrigated—7c; **Rock outcrop**—nonirrigated—8s; **Piute, cool**—nonirrigated—7s

Range site: **Sandbench**—Sandy Upland 6-10" p.z.;

Rock outcrop—not assigned; **Piute, cool**—Sandstone Upland 6-10" p.z.

527—Outpost sandy clay loam, 0 to 2 percent slopes

Setting

Landform: Flood plains

Shape of areas: Long and narrow

Size of areas: 100 to 2,000 acres

Elevation: 5,000 to 6,000 feet

Mean annual precipitation: 6 to 8 inches

Mean annual air temperature: 52 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Outpost soil and similar soils: 90 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- The moderately sodic Gotho and Shumbegay soils on low stream terraces
- The coarse textured Trail soil on small alluvial fans

Typical Profile

- 0 to 3 inches—pale brown sandy clay loam
- 3 to 35 inches—pale brown and light grayish brown clay loam and silty clay
- 35 to 58 inches—pale brown stratified sandy loam to silt loam
- 58 to 80 inches—pale brown stratified loamy sand to silty clay loam

Soil Properties and Qualities

Parent material: Alluvium derived from sandstone and shale

Depth class: Very deep

Drainage class: Well drained

Permeability: Slow to 35 inches, moderately rapid and moderate below a depth of 35 inches

Available water capacity: Moderate to high

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Severe

Flooding frequency: Occasional, very brief periods

Salinity: Slightly saline below a depth of 19 inches

Major Uses

Livestock grazing

Dominant vegetation in potential plant community: alkali sacaton, galleta, fourwing saltbush, bottlebrush squirreltail, Indian ricegrass

Annual production of air-dry vegetation (pounds per acre):

Favorable years—650

Unfavorable years—400

Present plant community:

alkali sacaton, galleta, Russian-thistle, annual forbs

Major limitations: hazard of soil blowing, flooding

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate factors.
- Vary the season of grazing and the periods of rest during successive years.
- Control the time and amount of use by livestock.
- Provide periodic rest during spring in alternate years.
- Reduce the risk of soil blowing by preventing

overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: Nonirrigated—7c

Range site: Clay fan 6-10" p.z.

528—Mack fine sandy loam, 1 to 3 percent slopes

Setting

Landform: High stream terraces

Shape of areas: Elongate

Size of areas: 100 to 1,000 acres

Elevation: 5,500 to 6,000 feet

Mean annual precipitation: 6 to 8 inches

Mean annual air temperature: 52 to 54 degrees F

Frost-free period: 140 to 160 days

Composition

Mack soil and similar soils: 85 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The moderately coarse textured Sogzie soil on eolian-mantled areas
- The very gravelly Blackston soil on slopes ranging from 5 to 15 percent
- The moderately deep Grazane soil on risers of stream terraces

Typical Profile

- 0 to 3 inches—brown fine sandy loam
- 3 to 7 inches—reddish brown fine sandy loam
- 7 to 13 inches—light reddish brown sandy clay loam
- 13 to 19 inches—pink sandy clay loam
- 19 to 51 inches—pinkish white and pink loam and sandy loam
- 51 to 65 inches—pink sandy loam

Soil Properties and Qualities

Parent material: Alluvium and eolian material derived from sandstone and shale

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Moderate to high

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Severe

Salinity: Slightly saline below a depth of 51 inches

Major Uses

Livestock grazing

Dominant vegetation in potential plant community: galleta, blue grama, Indian ricegrass, bottlebrush squirreltail, sand dropseed, winterfat, Greene rabbitbrush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—700

Unfavorable years—300

Present plant community:

galleta, Indian ricegrass, blue grama

Major limitations: hazard of soil blowing

Suitable management practices and concerns:

- Continuous, intensive year-round grazing results in a deteriorated plant community that has low value as forage.
- Suitability for range seeding is poor because of climate factors.
- Vary the season of grazing and the periods of rest during successive years.
- Control the time and amount of use by livestock.
- Provide periodic rest during spring in alternate years.
- Reduce the risk of soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Interpretive Groups

Land capability classification: Nonirrigated—7c

Range site: Loamy Upland, 6-10" p.z.

600—Kunz-Yahmore complex, 2 to 35 percent slopes

Setting

Landform: Broad, stable landslides

Position on the landform: **Kunz**—knolls and footslopes; **Yahmore**—toeslopes

Slope: **Kunz**—10 to 35 percent; **Yahmore**—2 to 10 percent

Shape of areas: Irregular

Size of areas: 100 to 2,000 acres

Elevation: 7,500 to 8,000 feet

Mean annual precipitation: 16 to 18 inches

Mean annual air temperature: 43 to 45 degrees F

Frost-free period: 100 to 120 days

Composition

Kunz very flaggy fine sandy loam, extremely

bouldery and similar soils: 50 percent

Yahmore fine sandy loam and similar soils: 40 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- The non-wooded Bostwick soil on small fan terraces
- Very deep soils similar to Kunz which have rubbly surface phases
- The poorly drained Canburn soil on narrow flood plains

Characteristics of the Kunz Soil

Typical profile:

- Soil surface is covered by 1 inch of pine needles, cones, and twigs
- 0 to 4 inches—dark brown very flaggy fine sandy loam
- 4 to 11 inches—reddish brown gravelly sandy clay loam
- 11 to 23 inches—yellowish red sandy clay loam
- 23 to 38 inches—very pale brown and pink fine sandy loam
- 38 to 66 inches—very pale brown and reddish yellow sandy loam and fine sandy loam

Parent material: Colluvium derived from sandstone and shale

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Moderate to high

Surface runoff: Medium

Hazard of water erosion: Moderate

Hazard of soil blowing: Slight

Characteristics of the Yahmore Soil

Typical profile:

- Soil surface is covered by 1 inch of pine needles, cones, and twigs
- 0 to 5 inches—brown fine sandy loam
- 5 to 33 inches—brown fine sandy loam
- 33 to 64 inches—reddish brown and yellowish red sandy clay loam

Parent material: Alluvium derived from sandstone and shale

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate
Available water capacity: High
Surface runoff: Slow
Hazard of water erosion: Slight
Hazard of soil blowing: Slight

Major Uses

Timber production
 Livestock grazing

Timber production

Kunz soil

Dominant overstory vegetation:
 ponderosa pine (100%)
Average site index: 58
Overstory production per acre (commercial):
 43 to 45 cubic feet or 260 to 270 board feet (Scribner
 rule) of timber from a stand of ponderosa pine
 trees 60 years old

Yahmore soil

Dominant overstory vegetation:
 ponderosa pine (100%)
Average site index: 60
Overstory production per acre (commercial):
 45 to 47 cubic feet or 270 to 280 board feet (Scribner
 rule) of timber from a stand of ponderosa pine
 trees 50 years old

Major limitations:

Kunz—hazard of water erosion, equipment
 limitations, seedling mortality, plant competition

Yahmore—plant competition

Suitable management practices and concerns:

- Manage the stands of ponderosa pine for a combination of uses, including wood production.
- Snowpack and spring thaw limit the use of equipment and restrict access.
- Unsurfaced roads and skid trails are muddy when wet. They may be impassable during rainy periods.
- Roads may require ballast for use during logging operations.
- Adequately designed road drainage reduces the risk of water erosion.
- Maintaining the understory vegetation is essential in controlling erosion.
- Restrict the use of wheeled and tracked equipment to periods when the soils are dry or frozen to prevent ruts, reduce compaction and subsequent water erosion, and prevent damage to the roots of trees.
- To help prevent soil compaction, use suitable methods of harvest and lay out skid trails well in advance.
- The careful use of wheeled and tracked equipment

will help preserve the protective layers of duff on the soil surfaces.

- Reduce the problem of competition from unwanted plants by preventing the over-harvest of trees.

Kunz soil

- Reduce the risk of water erosion by preventing excessive disturbance of the soil.
- The use of wheeled and tracked equipment in harvesting timber on this soil is moderately restricted in most places because of the presence of slopes over 15 percent and large surface stones.
- Boulders on the soil surface cause breakage of timber and hinder yarding.
- Reduce the problem of seedling mortality by leaving some of the larger trees to provide shade for seedling trees.
- Mulch with duff or small slash around tree seedlings to retain soil moisture and help alleviate seedling mortality.

Yahmore soil

- If healthy seed trees are left in a stand, reforestation will occur naturally in cutover areas.
- Machine planting may be practical in nearly level areas.
- Plant competition can be controlled by properly preparing the site and by cutting or girdling to eliminate unwanted weeds, brush, or trees.

Livestock grazing

Kunz soil

Dominant understory vegetation in potential plant community:

Gambel oak, blue grama, bottlebrush squirreltail, pinyon, Rocky Mountain juniper, prairie junegrass, earth sedge, Bailey yucca, pingue, silvery lupine

Annual production of air-dry vegetation (pounds per acre):

Favorable years—700

Unfavorable years—300

Present understory plant community:

Gambel oak, blue grama, bottlebrush squirreltail, earth sedge, Bailey yucca, pinyon, pingue

Yahmore soil

Dominant understory vegetation in potential plant community:

blue grama, bottlebrush squirreltail, needleandthread, Gambel oak, silvery lupine, pingue, pinyon, Rocky Mountain juniper, mountain big sagebrush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—700

Unfavorable years—300

Present understory plant community:

blue grama, bottlebrush squirreltail, pingue, silvery lupine, Gambel oak, pinyon, mountain big sagebrush

Major limitations:

Kunz—hazard of water erosion, surface rock fragments

Suitable management practices and concerns:

- Where the density of the canopy is less than about 50 percent, the understory produces plants suitable for grazing.
- Delay grazing until the soils are dry and firm enough to withstand trampling by livestock.
- Uniform distribution of grazing is difficult because of the slope or the lack of permanent water developments, or both.
- Reduce the risk of water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Kunz soil

- The suitability for non-mechanized range seeding is poor because of soil factors.

Yahmore soil

- To increase forage production, seed disturbed areas to suited grasses by broadcasting.
- The suitability for non-mechanized range seeding is good.
- Adequate site preparation is needed for successful seeding of understory plants.
- Seed late in the fall for best results.
- After seeding, defer grazing until the young grasses and tree seedlings are well established.

Interpretive Groups

Land capability classification: **Kunz**—nonirrigated—4e; **Yahmore**—nonirrigated—4e

Range site: **Kunz**—not assigned (forestland); **Yahmore**—not assigned (forestland)

602—Bostwick-Canburn complex, 0 to 5 percent slopes

Setting

Landform: Open valleys on stable landslides

Position on the landform: **Bostwick**—toeslopes and fan terraces; **Canburn**—flood plains

Slope: **Bostwick**—1 to 5 percent; **Canburn**—0 to 2 percent

Shape of areas: Irregular

Size of areas: 20 to 200 acres

Elevation: 7,500 to 8,200 feet

Mean annual precipitation: 16 to 18 inches

Mean annual air temperature: 43 to 45 degrees F

Frost-free period: 100 to 120 days

Composition

Bostwick fine sandy loam and similar soils: 50 percent

Canburn silt loam and similar soils: 30 percent

Contrasting inclusions: 20 percent

Contrasting Inclusions

- The moderately coarse textured Yahmore soil on wooded toeslopes
- The coarse textured Sandark soil on wooded fan terraces
- The moderately coarse textured Tuntsa soil on fan terraces
- The extremely bouldery Kunz soil on knolls

Characteristics of the Bostwick Soil

Typical profile:

- 0 to 10 inches—brown fine sandy loam
- 10 to 51 inches—light brown, brown, and yellowish brown sandy clay loam
- 51 to 65 inches—white fine sandy loam

Parent material: Alluvium derived from sandstone and shale

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: High to very high

Surface runoff: Medium

Hazard of water erosion: Moderate

Hazard of soil blowing: Slight

Characteristics of the Canburn Soil

Typical profile:

- Soil surface is covered by two inches of matted roots and plant fibers
- 0 to 10 inches—black silt loam
- 10 to 31 inches—black silty clay loam and clay loam
- 31 to 43 inches—brown fine sandy loam
- 43 to 65 inches—grayish brown stratified loamy sand to clay loam

Parent material: Alluvium derived from sandstone and shale

Depth class: Very deep

Drainage class: Poorly drained

Permeability: Moderately slow

Available water capacity: Very high

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Slight

Flooding frequency: Occasional, very brief periods

Depth to seasonal high water table: 1.0 to 2.0 feet

Major Uses

Livestock grazing

Bostwick soil

Dominant vegetation in potential plant community:

western wheatgrass, Wyoming big sagebrush, blue grama, bottlebrush squirreltail, sand dropseed, silvery lupine, Gambel oak

Annual production of air-dry vegetation (pounds per acre):

Favorable years—1,500

Unfavorable years—1,200

Present plant community:

western wheatgrass, Kentucky bluegrass, cheatgrass, bottlebrush squirreltail, silvery lupine, Wyoming big sagebrush, Gambel oak

Canburn soil

Dominant vegetation in potential plant community:

Baltic rush, tufted hairgrass, western wheatgrass, Rocky Mountain iris, willow, Woods rose

Annual production of air-dry vegetation (pounds per acre):

Favorable years—3,500

Unfavorable years—2,500

Present plant community:

Kentucky bluegrass, earth sedge, Baltic rush, Rocky Mountain iris, common dandelion

Major limitations:

Bostwick—hazard of water erosion

Canburn—hazard of water erosion, flooding, depth to water table

Suitable management practices and concerns:

- Delay grazing until the soils are dry and firm enough to withstand trampling by livestock.
- Continuous, intensive summer grazing results in a deteriorated plant community that has low value as forage.
- Provide periodic rest during spring in alternate years.
- Control the time and amount of use by livestock.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Reduce the risk of water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.
- Range seeding may be needed if the better forage plants have decreased.
- The suitability for mechanical range seeding is good.

Bostwick soil

- If shrubs are managed to create open areas, a

good stand of desirable grasses and forbs can be produced.

- Manage the brush in areas where unpalatable brushy plants have increased significantly. Control the brush by mechanical means or prescribed burning.
- Seed the range if the plant cover is not sufficient to protect the soil from erosion.
- Seed late in the fall for best results.
- After seeding, defer grazing until the young plants are well established.

Canburn soil

- To increase forage production, seed disturbed areas to suited grasses by drilling or broadcasting.
- Adequate site preparation is needed for successful seeding of plants.
- Seed late in the fall for best results.
- After seeding, defer grazing until the young plants are well established.

Interpretive Groups

Land capability classification: **Bostwick**—

nonirrigated—4c; **Canburn**—nonirrigated—3w

Range site: **Bostwick**—Loamy Upland 18-22" p.z.;

Canburn—Meadow 18-22" p.z.

604—Yahmore-Sandark complex, 1 to 15 percent slopes

Setting

Landform: Stable landslides

Position on the landform: **Yahmore**—toeslopes and footslopes; **Sandark**—fan terraces and toeslopes

Slope: **Yahmore**—1 to 15 percent; **Sandark**—1 to 15 percent

Shape of areas: Irregular

Size of areas: 100 to 2,000 acres

Elevation: 7,400 to 8,400 feet

Mean annual precipitation: 18 to 20 inches

Mean annual air temperature: 41 to 43 degrees F

Frost-free period: 90 to 110 days

Composition

Yahmore sandy loam and similar soils: 45 percent

Sandark loamy fine sand and similar soils: 40 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The moderately fine textured Kunz soil on knolls and footslopes
- The non-wooded Bostwick soil on toeslopes and fan terraces
- The coarse textured Deza soil on toeslopes

Characteristics of the Yahmore Soil

Typical profile:

- 0 to 3 inches—brown sandy loam
- 3 to 35 inches—dark brown and brown sandy loam
- 35 to 64 inches—light brown and pink sandy clay loam

Parent material: Alluvium derived from sandstone and shale

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: High

Surface runoff: Slow

Hazard of water erosion: Severe

Hazard of soil blowing: Slight

Characteristics of the Sandark Soil

Typical profile:

- Soil surface is covered by two inches of pine needles, cones, and twigs
- 0 to 5 inches—dark grayish brown loamy fine sand
- 5 to 36 inches—dark brown and brown loamy fine sand and fine sand
- 36 to 66 inches—brown fine sand and loamy fine sand

Parent material: Alluvium derived from sandstone

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Rapid

Available water capacity: Low to moderate

Surface runoff: Slow

Hazard of water erosion: Moderate

Hazard of soil blowing: Moderate

Major Uses

Timber production

Livestock grazing

Timber production

Yahmore soil

Dominant overstory vegetation:

ponderosa pine (100%)

Average site index: 62

Overstory production per acre (commercial):

47 to 49 cubic feet or 285 to 295 board feet (Scribner rule) of timber from a stand of ponderosa pine trees 50 years old

Sandark soil

Dominant overstory vegetation:

ponderosa pine (100%)

Average site index: 85

Overstory production per acre (commercial):

76 to 78 cubic feet or 455 to 465 board feet (Scribner rule) of timber from a stand of ponderosa pine trees 40 years old

Major limitations:

Yahmore—plant competition

Sandark—hazard of soil blowing, seedling mortality, plant competition

Suitable management practices and concerns:

- Manage the stands of ponderosa pine for a combination of uses, including wood production.
- Snowpack and spring thaw limit the use of equipment and restrict access.
- Maintaining the understory vegetation is essential in controlling erosion.
- Restrict the use of wheeled and tracked equipment to periods when the soils are dry or frozen to prevent ruts, reduce compaction and subsequent water erosion, and prevent damage to the roots of trees.
- To help prevent soil compaction, use suitable methods of harvest and lay out skid trails well in advance.
- Reduce the problem of competition from unwanted plants by preventing the over-harvest of trees.

Yahmore soil

- Unsurfaced roads and skid trails are muddy when wet. They may be impassable during rainy periods.
- Roads may require ballast for use during logging operations.
- Adequately designed road drainage reduces the risk of water erosion.
- Plant competition can be controlled by properly preparing the site and by cutting or girdling to eliminate unwanted weeds, brush, or trees.

Sandark soil

- Reduce the risk of soil blowing by preventing excessive disturbance of the soil and by seeding cuts and fills.
- The careful use of wheeled and tracked equipment will help preserve the protective layer of duff on the soil surface.
- If healthy seed trees are left in a stand, reforestation will occur naturally in cutover areas.
- Machine planting may be practical in nearly level areas.
- Droughtiness of the surface layer because of sandy textures increases seedling mortality, especially on south- and southwest-facing slopes.
- Reduce the problem of seedling mortality by leaving some of the larger trees to provide shade for seedling trees.
- Mulch with duff or small slash around tree

seedlings to retain soil moisture and help alleviate seedling mortality.

- Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees.

Livestock grazing

Yahmore soil

Dominant understory vegetation in potential plant community:

blue grama, bottlebrush squirreltail, needleandthread, Gambel oak, silvery lupine, pingue, pinyon, Rocky Mountain juniper, mountain big sagebrush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—700

Unfavorable years—300

Present understory plant community:

needleandthread, earth sedge, bottlebrush squirreltail, silvery lupine, pingue, Gambel oak

Sandark soil

Dominant understory vegetation in potential plant community:

Gambel oak, nodding brome, earth sedge, bottlebrush squirreltail, silvery lupine, mountain brome

Annual production of air-dry vegetation (pounds per acre):

Favorable years—800

Unfavorable years—300

Present understory plant community:

nodding brome, earth sedge, bottlebrush squirreltail, silvery lupine, Gambel oak, western brackenfern

Major limitations:

Sandark—hazard of soil blowing

Suitable management practices and concerns:

- Where the density of the canopy is less than about 60 percent, the understory produces plants suitable for grazing.
- Delay grazing until the soils are dry and firm enough to withstand trampling by livestock.
- Uniform distribution of grazing is difficult because of the lack of permanent water developments.
- Reduce the risk of soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.
- If trees and shrubs are managed to create open areas, a good stand of plants suitable for use as grazeable forage can be produced.
- To increase forage production, seed disturbed areas to suited grasses by broadcasting.
- The suitability for non-mechanized range seeding is good.

• Adequate site preparation is needed for successful seeding of understory plants.

• Seed late in the fall for best results.

• After seeding, defer grazing until the young grasses and tree seedlings are well established.

Interpretive Groups

Land capability classification: **Yahmore**—

nonirrigated—4e; **Sandark**—nonirrigated—4s

Range site: **Yahmore**—not assigned (forestland);

Sandark—not assigned (forestland)

606—Narbona-Deza complex, 5 to 50 percent slopes

Setting

Landform: Stable landslides

Position on the landform: **Narbona**—ridges; **Deza**—toeslopes and footslopes between ridges and hills

Slope: **Narbona**—15 to 50 percent; **Deza**—5 to 15 percent

Shape of areas: Elongate

Size of areas: 100 to 2,000 acres

Elevation: 8,000 to 8,600 feet

Mean annual precipitation: 18 to 20 inches

Mean annual air temperature: 41 to 43 degrees F

Frost-free period: 90 to 100 days

Composition

Narbona very flaggy sand, extremely stony and similar soils: 50 percent

Deza sand and similar soils: 40 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- The moderately coarse textured Tuntsa soil on narrow valley floors
- Rock outcrops as exposures of sandstone bedrock on cliff blocks ranging from 50 to 100 feet high
- The dark surfaced, moderately coarse textured Yahmore soil on toeslopes
- The moderately fine textured Kunz soil below Narbona Pass

Characteristics of the Narbona Soil

Typical profile:

- Soil surface is covered by 1 inch of pine needles, twigs, and oak leaves
- 0 to 4 inches—brown very flaggy sand
- 4 to 22 inches—pinkish gray very channery sand
- 22 to 66 inches—yellowish red very stony sandy clay loam and very stony sandy loam

Parent material: Colluvium derived from sandstone

Depth class: Very deep

Drainage class: Well drained

Permeability: Rapid in the upper part and moderate in the lower part

Available water capacity: Very low to low

Surface runoff: Medium

Hazard of water erosion: Severe

Hazard of soil blowing: Slight

Characteristics of the Deza Soil

Typical profile:

- Soil surface is covered by 1 inch of pine needles, twigs, and oak leaves
- 0 to 4 inches—brown sand
- 4 to 31 inches—pinkish gray sand
- 31 to 62 inches—pinkish gray sand with reddish brown loamy sand lamellae

Parent material: Alluvium derived from sandstone

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Rapid

Available water capacity: Very low to low

Surface runoff: Slow

Hazard of water erosion: Slight

Hazard of soil blowing: Moderate

Major Uses

Timber production

Livestock grazing

Timber production

Narbona soil

Dominant overstory vegetation:

ponderosa pine (80%), Douglas-fir (15%), quaking aspen (5%)

Average site index:

ponderosa pine—72

Douglas-fir—65

quaking aspen—79

Overstory production per acre (commercial):

- ponderosa pine—57 to 59 cubic feet or 345 to 355 board feet (Scribner rule) of timber from a stand of trees 50 years old;
- Douglas-fir—39 to 41 cubic feet or 235 to 245 board feet (Scribner rule) of timber from a stand of trees 70 years old;
- quaking aspen—45 to 47 cubic feet or 275 to 285 board feet (Scribner rule) of timber from a stand of trees 100 years old

Deza soil

Dominant overstory vegetation:

ponderosa pine (85%), Douglas-fir (10%), quaking aspen (5%)

Average site index:

ponderosa pine—84

Douglas-fir—65

quaking aspen—87

Overstory production per acre (commercial):

- ponderosa pine—74 to 76 cubic feet or 445 to 455 board feet (Scribner rule) of timber from a stand of trees 40 years old;
- Douglas-fir—39 to 41 cubic feet or 235 to 245 board feet (Scribner rule) of timber from a stand of trees 70 years old;
- quaking aspen—54 to 56 cubic feet or 325 to 335 board feet (Scribner rule) of timber from a stand of trees 110 years old

Major limitations:

Narbona—hazard of water erosion, equipment

limitations, seedling mortality, plant competition

Deza—hazard of soil blowing, equipment limitations,

seedling mortality, plant competition

Suitable management practices and concerns:

- Manage the stands of trees for a combination of uses, including wood production.
- Snowpack and spring thaw limit the use of equipment and restrict access.
- Adequately designed road drainage reduces the risk of water erosion.
- Remove the waste material resulting from road construction on gentle to moderate slopes to prevent damage to downhill vegetation and reduce a potential source of stream sedimentation.
- Improve stands by thinning before trees reach commercial size and by selective cutting of mature trees.
- Maintaining the understory vegetation is essential in controlling erosion.
- Reduce the risk of water erosion and soil blowing by preventing excessive disturbance of the soils and by seeding cuts and fills.
- Restrict the use of wheeled and tracked equipment to periods when the soils are dry or frozen to prevent ruts, reduce compaction and subsequent water erosion, and prevent damage to the roots of trees.
- The careful use of wheeled and tracked equipment will help preserve the protective layers of duff on the soil surfaces.
- If healthy seed trees are left in a stand, reforestation will occur naturally in cutover areas.
- Droughtiness of the surface layers because of sandy textures increases seedling mortality, especially on south- and southwest-facing slopes.
- Reduce the problem of seedling mortality by leaving some of the larger trees to provide shade for seedling trees.
- Mulch with duff or small slash around tree

seedlings to retain soil moisture and help alleviate seedling mortality.

- Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees.
- Reduce the problem of competition from unwanted plants by preventing the over-harvest of trees.

Narbona soil

- Use water bars and plant covers on steep yarding paths, skid trails, and firebreaks to control rilling and gullyng.
- The use of wheeled and tracked equipment in harvesting timber on this soil is moderately restricted in most places because of the presence of slopes over 15 percent and large surface stones.

Deza soil

- Machine planting may be practical in nearly level areas.
- Plant competition can be controlled by properly preparing the site and by cutting or girdling to eliminate unwanted weeds, brush, or trees.

Livestock grazing

Narbona soil

Dominant understory vegetation in potential plant community:

Gambel oak, earth sedge, nodding brome grass, bottlebrush squirreltail, prairie junegrass, silvery lupine, Oregon grape, Woods rose

Annual production of air-dry vegetation (pounds per acre):

Favorable years—700

Unfavorable years—300

Present understory plant community:

earth sedge, nodding brome grass, bottlebrush squirreltail, silvery lupine, Gambel oak, Oregon grape

Deza soil

Dominant understory vegetation in potential plant community:

silvery lupine, earth sedge, western brackenfern, bottlebrush squirreltail, nodding brome grass, Oregon grape, Gambel oak

Annual production of air-dry vegetation (pounds per acre):

Favorable years—800

Unfavorable years—300

Present understory plant community:

earth sedge, nodding brome grass, western brackenfern, silvery lupine, Gambel oak, bottlebrush squirreltail

Major limitations:

Narbona—hazard of water erosion, surface rock fragments, steep slopes

Deza—hazard of soil blowing

Suitable management practices and concerns:

- Where the density of the canopy is less than about 60 percent, the understory produces plants suitable for grazing.
- Uniform distribution of grazing is difficult because of the slope or the lack of permanent water developments, or both.
- Livestock prefer to graze the easily accessible areas before they graze the steep slopes.
- Reduce the risk of water erosion and soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.
- To increase forage production, seed disturbed areas to suited grasses by broadcasting.
- Adequate site preparation is needed for successful seeding of understory plants.
- Seed late in the fall for best results.
- After seeding, defer grazing until the young grasses and tree seedlings are well established.

Narbona soil

- The suitability for non-mechanized range seeding is fair because of soil factors.

Deza soil

- The suitability for non-mechanized range seeding is good.

Interpretive Groups

Land capability classification: **Narbona**—

nonirrigated—7e; **Deza**—nonirrigated—4s

Range site: **Narbona**—not assigned (forestland);

Deza—not assigned (forestland)

608—Narbona-Zilditloi complex, 45 to 90 percent slopes

Setting

Landform: Escarpments below high plateaus

Position on the landform: **Narbona**—small landslides; **Zilditloi**—backslopes

Slope: **Narbona**—45 to 70 percent; **Zilditloi**—60 to 90 percent

Shape of areas: Elongate

Size of areas: 200 to 2,000 acres

Elevation: 7,600 to 9,000 feet

Mean annual precipitation: 16 to 20 inches

Mean annual air temperature: 40 to 43 degrees F

Frost-free period: 80 to 110 days

Composition

Narbona very flaggy loamy sand, extremely bouldery and similar soils: 50 percent

Zilditloi loamy sand, very stony and similar soils: 35 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- Rock outcrop as exposures of sandstone bedrock occurring on small vertical cliffs
- The dark surfaced Bangston soil on north-facing backslopes
- Soils similar to Tunitcha that are moderately deep on south-facing backslopes

Characteristics of the Narbona Soil

Typical profile:

- Soil surface is covered by 1 inch of pine needles, oak leaves, and twigs
- 0 to 7 inches—brown very flaggy loamy sand
- 7 to 28 inches—pinkish gray very channery loamy sand
- 28 to 63 inches—light brown and reddish yellow very stony sandy loam and very stony sandy clay loam

Parent material: Colluvium derived from sandstone

Depth class: Very deep

Drainage class: Well drained

Permeability: Rapid in the upper part and moderate in the lower part

Available water capacity: Very low to low

Surface runoff: Rapid

Hazard of water erosion: Severe

Hazard of soil blowing: Slight

Characteristics of the Zilditloi Soil

Typical profile:

- 0 to 7 inches—brown loamy sand
- 7 to 31 inches—very pale brown sand
- 31 to 70 inches—very pale brown sand

Parent material: Colluvium and residuum derived from sandstone

Depth class: Very deep

Drainage class: Excessively drained

Permeability: Rapid

Available water capacity: Very low to low

Surface runoff: Rapid

Hazard of water erosion: Very severe

Hazard of soil blowing: Moderate

Major Uses

Timber production

Livestock grazing

Timber production

Narbona soil

Dominant overstory vegetation:

ponderosa pine (90%), Douglas-fir (5%), quaking aspen (5%)

Average site index:

ponderosa pine—72

Douglas-fir—65

quaking aspen—79

Overstory production per acre (commercial):

• ponderosa pine—57 to 59 cubic feet or 345 to 355 board feet (Scribner rule) of timber from a stand of trees 50 years old;

• Douglas-fir—39 to 41 cubic feet or 235 to 245 board feet (Scribner rule) of timber from a stand of trees 70 years old;

• quaking aspen—46 to 48 cubic feet or 275 to 285 board feet (Scribner rule) of timber from a stand of trees 100 years old

Zilditloi soil

Dominant overstory vegetation:

ponderosa pine (75%), pinyon (25%)

Average site index:

ponderosa pine—70

pinyon—70

Overstory production per acre (commercial):

54 to 56 cubic feet or 325 to 335 board feet (Scribner rule) of timber from a stand of ponderosa pine trees 50 years old

Overstory production (per acre):

fuelwood—11 to 13 cords in a stand of pinyon trees that averages 5 inches in diameter at a height of 1 foot; posts—0 to 5; Christmas trees—5 to 10; ornamental trees—5 to 10

Major limitations:

Narbona—hazard of water erosion, equipment limitations, seedling mortality

Zilditloi—hazard of water erosion, hazard of soil blowing, equipment limitations, seedling mortality, plant competition

Suitable management practices and concerns:

- Snowpack and spring thaw limit the use of equipment and restrict access.
- The use of wheeled and tracked equipment in harvesting timber or other wood products on these soils is severely restricted in most places because of the presence of slopes over 35 percent, large surface stones, and occasional rock outcrops.
- Road construction should be avoided on slopes greater than 60 percent.
- Remove the waste material resulting from road construction on moderate slopes to prevent damage to downhill vegetation and reduce a potential source of stream sedimentation.
- Maintaining the understory vegetation is essential in controlling erosion.
- Droughtiness of the surface layers because of

sandy textures increases seedling mortality, especially on south- and southwest-facing slopes.

- Reduce the problem of seedling mortality by leaving some of the larger trees to provide shade for seedling trees.

Narbona soil

- Use water bars and plant covers on steep yarding paths, skid trails, and firebreaks to control rilling and gullyng.
- Boulders on the soil surface and rock outcrops cause breakage of timber and hinder yarding.
- Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees.

Zilditloi soil

- Reduce the risk of water erosion and soil blowing by preventing any disturbance of the soil and by seeding cuts and fills.
- Tree seedlings have a low rate of survival because of high summer temperatures and the low water holding capacity of the soil.

Livestock grazing

Narbona soil

Dominant understory vegetation in potential plant community:

Gambel oak, earth sedge, nodding brome grass, bottlebrush squirreltail, prairie junegrass, silvery lupine, Oregon grape, Woods rose

Annual production of air-dry vegetation (pounds per acre):

Favorable years—700

Unfavorable years—300

Present understory plant community:

Gambel oak, antelope bitterbrush, nodding brome grass, earth sedge, Oregon grape

Zilditloi soil

Dominant understory vegetation in potential plant community:

Gambel oak, muttongrass, Indian ricegrass, antelope bitterbrush, bottlebrush squirreltail, Rocky Mountain juniper, Utah serviceberry, Bailey yucca, hairy goldaster

Annual production of air-dry vegetation (pounds per acre):

Favorable years—700

Unfavorable years—300

Present understory plant community:

antelope bitterbrush, Gambel oak, Indian ricegrass, muttongrass, bottlebrush squirreltail, hairy goldaster, Utah serviceberry, Bailey yucca

Major limitations:

Narbona—hazard of water erosion, steep slopes, surface rock fragments

Zilditloi—hazard of water erosion, hazard of soil blowing, steep slopes

Suitable management practices and concerns:

- Uniform distribution of grazing is difficult because of the slope.
- Livestock prefer to graze the easily accessible areas on adjacent map units before they graze the steep slopes of this unit.
- Reduce the risk of water erosion and soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.
- The suitability for non-mechanized range seeding of grasses is poor because of soil factors.

Interpretive Groups

Land capability classification: **Narbona**—

nonirrigated—7e; **Zilditloi**—nonirrigated—7e

Range site: **Narbona**—not assigned (forestland);

Zilditloi—not assigned (forestland)

610—Kunz-Xankey complex, 5 to 45 percent slopes

Setting

Landform: Mesas and stable landslides

Position on the landform: **Kunz**—footslopes;

Xankey—backslopes

Slope: **Kunz**—5 to 15 percent; **Xankey**—25 to 45 percent

Shape of areas: Irregular

Size of areas: 50 to 1,000 acres

Elevation: 7,500 to 8,200 feet

Mean annual precipitation: 16 to 18 inches

Mean annual air temperature: 43 to 45 degrees F

Frost-free period: 100 to 120 days

Composition

Kunz fine sandy loam and similar soils: 55 percent

Xankey very cobbly loam, extremely stony and similar soils: 35 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- The moderately coarse textured Yahmore soil on toeslopes

- The moderately coarse textured Tuntsa soils on non-wooded footslopes
- The non-wooded Bostwick soil on toeslopes and fan terraces

Characteristics of the Kunz Soil

Typical profile:

- Soil surface is covered by 1 inch of pine needles, oak leaves, and twigs
- 0 to 6 inches—brown fine sandy loam
- 6 to 26 inches—brown sandy clay loam
- 26 to 70 inches—reddish brown and brown clay loam

Parent material: Alluvium derived from sandstone and basalt

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately slow

Available water capacity: High to very high

Surface runoff: Medium

Hazard of water erosion: Moderate

Hazard of soil blowing: Slight

Characteristics of the Xankey Soil

Typical profile:

- Soil surface is covered by 1 inch of pine needles, oak leaves, and twigs
- 0 to 6 inches—dark brown very cobbly loam
- 6 to 30 inches—brown very cobbly sandy clay loam and very stony sandy clay loam
- 30 to 63 inches—light brown, light gray, and very pale brown sandy loam

Parent material: Colluvium derived from sandstone and basalt

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Low to moderate

Surface runoff: Rapid

Hazard of water erosion: Severe

Hazard of soil blowing: Slight

Major Uses

Timber production

Livestock grazing

Timber production

Kunz soil

Dominant overstory vegetation:

ponderosa pine (100%)

Average site index: 80

Overstory production per acre (commercial):

68 to 70 cubic feet or 410 to 420 board feet (Scribner

rule) of timber from a stand of ponderosa pine trees 40 years old

Xankey soil

Dominant overstory vegetation:

ponderosa pine (100%)

Average site index: 73

Overstory production per acre (commercial):

58 to 60 cubic feet or 350 to 360 board feet (Scribner rule) of timber from a stand of ponderosa pine trees 50 years old

Major limitations:

Kunz—hazard of water erosion, plant competition

Xankey—hazard of water erosion, equipment limitations, seedling mortality, plant competition

Suitable management practices and concerns:

- Manage the stands of ponderosa pine for a combination of uses, including wood production.
- Snowpack and spring thaw limit the use of equipment and restrict access.
- Unsurfaced roads and skid trails are muddy when wet. They may be impassable during rainy periods.
- Roads may require ballast for use during logging operations.
- Adequately designed road drainage reduces the risk of water erosion.
- Remove the waste material resulting from road construction on gentle to moderate slopes to prevent damage to downhill vegetation and reduce a potential source of stream sedimentation.
- Maintaining the understory vegetation is essential in controlling erosion.
- Reduce the risk of water erosion by preventing excessive disturbance of the soils and by seeding cuts and fills.
- The careful use of wheeled and tracked equipment will help preserve the protective layers of duff on the soil surfaces.
- Restrict the use of wheeled and tracked equipment to periods when the soils are dry or frozen to prevent ruts, reduce compaction and subsequent water erosion, and prevent damage to the roots of trees.
- To help prevent soil compaction, use suitable methods of harvest and lay out skid trails well in advance.
- If healthy seed trees are left in a stand, reforestation will occur naturally in cutover areas.
- Reduce the problem of competition from unwanted plants by preventing the over-harvest of trees.

Kunz soil

- Machine planting may be practical in nearly level areas.
- Plant competition can be controlled by properly

preparing the site and by cutting or girdling to eliminate unwanted weeds, brush, or trees.

Xankey soil

- Use water bars and plant covers on steep yarding paths, skid trails, and firebreaks to control rilling and gullyng.
- The use of wheeled and tracked equipment in harvesting timber on this soil is moderately restricted in most places because of the presence of slopes over 15 percent and large surface stones.
- Reduce the problem of seedling mortality by leaving some of the larger trees to provide shade for seedling trees.
- Plant competition delays natural regeneration but it does not prevent the eventual development of a fully stocked, normal stand of trees.

Livestock grazing

Kunz soil

Dominant understory vegetation in potential plant community:

Gambel oak, bottlebrush squirreltail, muttongrass, blue grama, pingue, Oregongrape

Annual production of air-dry vegetation (pounds per acre):

Favorable years—800

Unfavorable years—300

Present understory plant community:

Gambel oak, Bailey yucca, pingue, muttongrass, earth sedge, bottlebrush squirreltail

Xankey soil

Dominant understory vegetation in potential plant community:

Gambel oak, pinyon, muttongrass, bottlebrush squirreltail, earth sedge, thrifty goldenweed, pingue, Bailey yucca, Oregongrape

Annual production of air-dry vegetation (pounds per acre):

Favorable years—700

Unfavorable years—300

Present understory plant community:

Gambel oak, pinyon, Bailey yucca, thrifty goldenweed, Oregongrape, earth sedge, bottlebrush squirreltail, muttongrass

Major limitations:

Kunz—hazard of water erosion

Xankey—hazard of water erosion, steep slopes, surface rock fragments

Suitable management practices and concerns:

- Where the density of the canopy is less than about 50 percent, the understory produces plants suitable for grazing.

• Uniform distribution of grazing is difficult because of the slope or the lack of permanent water developments, or both.

- Reduce the risk of water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.
- To increase forage production, seed disturbed areas to suited grasses by broadcasting.
- Adequate site preparation is needed for successful seeding of understory plants.
- Seed late in the fall for best results.
- After seeding, defer grazing until the young grasses and tree seedlings are well established.

Kunz soil

- The suitability for non-mechanized range seeding is good.

Xankey soil

- The suitability for non-mechanized range seeding is poor because of soil factors.

Interpretive Groups

Land capability classification: **Kunz**—nonirrigated—4c; **Xankey**—nonirrigated—7e

Range site: **Kunz**—not assigned (forestland);

Xankey—not assigned (forestland)

612—Xankey very cobbly loam, 45 to 70 percent slopes, extremely bouldery

Setting

Landform: Stable landslides

Position on the landform: backslopes

Shape of areas: Elongate

Size of areas: 100 to 1,000 acres

Elevation: 7,900 to 8,500 feet

Mean annual precipitation: 18 to 20 inches

Mean annual air temperature: 42 to 44 degrees F

Frost-free period: 90 to 100 days

Composition

Xankey soil and similar soils: 85 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The deep Tunitcha soil on backslopes at highest elevations
- The moderately fine textured Kunz soil on footslopes
- The warmer Iwela soil on south-facing slopes

- Rubble land on very steeply sloping talus piles
- Rock outcrop as exposures of basalt bedrock occurring on vertical cliffs

Typical Profile

- Soil surface is covered by 1 inch of pine needles, oak leaves, and twigs
- 0 to 6 inches—brown very cobbly loam
- 6 to 29 inches—brown very cobbly sandy clay loam and very stony sandy clay loam
- 29 to 64 inches—yellowish red and reddish yellow sandy loam

Soil Properties and Qualities

Parent material: Colluvium derived from sandstone and basalt

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Low to moderate

Surface runoff: Rapid

Hazard of water erosion: Severe

Hazard of soil blowing: Slight

Major Uses

Timber production

Livestock grazing

Timber production

Dominant overstory vegetation:

ponderosa pine (90%), Douglas-fir (10%)

Average site index:

ponderosa pine—73

Douglas-fir—65

Overstory production per acre (commercial):

- ponderosa pine—58 to 60 cubic feet or 350 to 360 board feet (Scribner rule) of timber from a stand of trees 50 years old;
- Douglas-fir—39 to 41 cubic feet or 235 to 245 board feet (Scribner rule) of timber from a stand of trees 70 years old

Major limitations: hazard of water erosion, equipment limitations, seedling mortality, plant competition

Suitable management practices and concerns:

- Manage the stands of trees for a combination of uses, including wood production.
- Snowpack and spring thaw limit the use of equipment and restrict access.
- Unsurfaced roads and skid trails are muddy when wet. They may be impassable during rainy periods.
- Roads may require ballast for use during logging operations.
- Adequately designed road drainage reduces the risk of water erosion.

- Remove the waste material resulting from road construction on moderate slopes to prevent damage to downhill vegetation and reduce a potential source of stream sedimentation.
- Road construction should be avoided on slopes greater than 60 percent.
- The use of wheeled and tracked equipment in harvesting timber on this soil is severely restricted in most places because of the presence of slopes over 35 percent and large surface stones.
- Maintaining the understory vegetation is essential in controlling erosion.
- Reduce the risk of water erosion by preventing excessive disturbance of the soil and by seeding cuts and fills.
- Use water bars and plant covers on steep yarding paths, skid trails, and firebreaks to control rilling and gullyng.
- Boulders on the soil surface cause breakage of timber and hinder yarding.
- If healthy seed trees are left in a stand, reforestation will occur naturally in cutover areas.
- Reduce the problem of seedling mortality by leaving some of the larger trees to provide shade for seedling trees.
- Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees.

Livestock grazing

Dominant understory vegetation in potential plant community:

Gambel oak, pinyon, muttongrass, bottlebrush squirreltail, earth sedge, thrifty goldenweed, pingue, Bailey yucca, Oregon grape

Annual production of air-dry vegetation (pounds per acre):

Favorable years—700

Unfavorable years—300

Present understory plant community:

Gambel oak, Oregon grape, Bailey yucca, pinyon, pingue, muttongrass, earth sedge, bottlebrush squirreltail

Major limitations: hazard of water erosion, steep slopes, surface rock fragments

Suitable management practices and concerns:

- Uniform distribution of grazing is difficult because of the slope.
- Livestock prefer to graze the easily accessible areas on adjacent map units, before they graze the steep slopes of this unit.
- Reduce the risk of water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

- The suitability for non-mechanized range seeding of grasses is poor because of soil factors.

Interpretive Groups

Land capability classification: Nonirrigated—7e

Range site: Not assigned (forestland)

614—Kunz-Tuntsa-Yahmore complex, 3 to 45 percent slopes

Setting

Landform: Stable landslides

Position on the landform: **Kunz**—backslopes;

Tuntsa—footslopes; **Yahmore**—footslopes

Slope: **Kunz**—25 to 45 percent; **Tuntsa**—3 to 15 percent; **Yahmore**—5 to 15 percent

Shape of areas: Elongate

Size of areas: 500 to 1,000 acres

Elevation: 7,600 to 8,600 feet

Mean annual precipitation: 18 to 20 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 90 to 110 days

Composition

Kunz very flaggy loam, very bouldery and similar soils: 45 percent

Tuntsa fine sandy loam and similar soils: 25 percent

Yahmore loam and similar soils: 20 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- The extremely bouldery surface phase of the Xankey soil on backslopes of greater than 45 percent
- Rock outcrop as exposures of basalt bedrock occurring on cliff blocks ranging from 25 to 75 feet high

Characteristics of the Kunz Soil

Typical profile:

- Soil surface is covered by 1 inch of pine needles, cones, and twigs
- 0 to 2 inches—dark brown very flaggy loam
- 2 to 6 inches—dark brown flaggy loam
- 6 to 28 inches—brown and reddish brown clay loam
- 28 to 65 inches—yellowish red sandy clay loam

Parent material: Colluvium derived from basalt and sandstone

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately slow

Available water capacity: High to very high

Surface runoff: Rapid

Hazard of water erosion: Very severe

Hazard of soil blowing: Slight

Characteristics of the Tuntsa Soil

Typical profile:

- 0 to 9 inches—very dark grayish brown and very dark gray fine sandy loam
- 9 to 45 inches—very dark gray, dark gray, and dark grayish brown fine sandy loam
- 45 to 63 inches—brown fine sandy loam

Parent material: Alluvium derived from basalt and sandstone

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: High

Surface runoff: Medium

Hazard of water erosion: Severe

Hazard of soil blowing: Slight

Characteristics of the Yahmore Soil

Typical profile:

- 0 to 9 inches—dark brown loam
- 9 to 24 inches—dark brown sandy loam
- 24 to 64 inches—brown sandy loam

Parent material: Alluvium derived from sandstone and basalt

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: High

Surface runoff: Slow

Hazard of water erosion: Very severe

Hazard of soil blowing: Slight

Major Uses

Timber production

Livestock grazing

Timber production

Kunz soil

Dominant overstory vegetation:

ponderosa pine (100%)

Average site index: 70

Overstory production per acre (commercial):

54 to 56 cubic feet or 325 to 335 board feet (Scribner rule) of timber from a stand of ponderosa pine trees 50 years old

Yahmore soil

Dominant overstory vegetation:

ponderosa pine (100%)

Average site index: 75

Overstory production per acre (commercial):

61 to 63 cubic feet or 365 to 375 board feet (Scribner

rule) of timber from a stand of ponderosa pine trees 50 years old

Major limitations:

Kunz—hazard of water erosion, equipment

limitations, seedling mortality, plant competition

Yahmore—hazard of water erosion, plant competition

Suitable management practices and concerns:

- Manage the stands of ponderosa pine for a combination of uses, including wood production.
- Snowpack and spring thaw limit the use of equipment and restrict access.
- Unsurfaced roads and skid trails are muddy when wet. They may be impassable during rainy periods.
- Roads may require ballast for use during logging operations.
- Adequately designed road drainage reduces the risk of water erosion.
- Remove the waste material resulting from road construction on gentle to moderate slopes to prevent damage to downhill vegetation and reduce a potential source of stream sedimentation.
- Maintaining the understory vegetation is essential in controlling erosion.
- Reduce the risk of water erosion by preventing excessive disturbance of the soils and by seeding cuts and fills.
- Improve stands by thinning before trees reach commercial size and by selective cutting of mature trees.
- Reduce the problem of competition from unwanted plants by preventing the over-harvest of trees.

Kunz soil

- Use water bars and plant covers on steep yarding paths, skid trails, and firebreaks to control rilling and gullyng.
- The use of wheeled and tracked equipment in harvesting timber on this soil is severely restricted in some places because of the presence of slopes over 35 percent.
- Boulders on the soil surface cause breakage of timber and hinder yarding.
- If healthy seed trees are left in a stand, reforestation will occur naturally in cutover areas.
- Reduce the problem of seedling mortality by leaving some of the larger trees to provide shade for seedling trees.
- Mulch with duff or small slash around tree seedlings to retain soil moisture and help alleviate seedling mortality.
- Plant competition delays natural regeneration but it does not prevent the eventual development of a fully stocked, normal stand of trees.

Yahmore soil

- Restrict the use of wheeled and tracked equipment

to periods when the soil is dry or frozen to prevent ruts, reduce compaction and subsequent water erosion, and prevent damage to the roots of trees.

- To help prevent soil compaction, use suitable methods of harvest and lay out skid trails well in advance.
- Machine planting may be practical in nearly level areas.
- Plant competition can be controlled by properly preparing the site and by cutting or girdling to eliminate unwanted weeds, brush, or trees.

Livestock grazing

Kunz soil

Dominant understory vegetation in potential plant community:

Gambel oak, muttongrass, mountain muhly, bottlebrush squirreltail, earth sedge, Bailey yucca, Oregon grape

Annual production of air-dry vegetation (pounds per acre):

Favorable years—700

Unfavorable years—300

Present understory plant community:

Gambel oak, Bailey yucca, Oregon grape, muttongrass, earth sedge, mountain muhly

Tuntsa soil

Dominant vegetation in potential plant community:

blue grama, western wheatgrass, black sagebrush, bottlebrush squirreltail, silvery lupine, pingue

Annual production of air-dry vegetation (pounds per acre):

Favorable years—1,500

Unfavorable years—1,200

Present plant community:

blue grama, pingue, western wheatgrass, cheatgrass, bottlebrush squirreltail, silvery lupine, black sagebrush

Yahmore soil

Dominant understory vegetation in potential plant community:

blue grama, bottlebrush squirreltail, needleandthread, Gambel oak, silvery lupine, pingue, pinyon, Rocky Mountain juniper, mountain big sagebrush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—700

Unfavorable years—300

Present understory plant community:

Gambel oak, Oregon grape, pingue, Rocky Mountain juniper, blue grama, muttongrass, earth sedge

Major limitations:

Kunz—hazard of water erosion, surface rock fragments, steep slopes

Tuntsa—hazard of water erosion

Yahmore—hazard of water erosion

Suitable management practices and concerns:

- Where the density of the canopy is less than about 50 percent, the understory produces plants suitable for grazing.
- Uniform distribution of grazing is difficult because of the slope or the lack of permanent water developments, or both.
- Livestock prefer to graze the easily accessible areas before they graze the steep slopes.
- Reduce the risk of water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.
- To increase forage production, seed disturbed areas to suited grasses by broadcasting.
- Adequate site preparation is needed for successful seeding of understory plants.
- Seed late in the fall for best results.
- After seeding, defer grazing until the young grasses and tree seedlings are well established.

Kunz soil

- The suitability for non-mechanized range seeding of grasses is poor because of soil factors.

Yahmore soil

- The suitability for non-mechanized range seeding of grasses is good.

Tuntsa soil

- Continuous, intensive summer grazing results in a deteriorated plant community that has low value as forage.
- Vary the season of grazing and the periods of rest during successive years.
- Control the time and amount of use by livestock.
- Provide periodic rest during spring in alternate years.
- Promote uniform grazing by fencing, properly locating watering facilities, properly distributing salt licks, and proper stocking.
- Range seeding may be needed if the better forage plants have decreased.
- The suitability for mechanical range seeding is good.
- If shrubs are managed to create open areas, a good stand of desirable grasses and forbs can be produced.
- Manage the brush in areas where unpalatable brushy plants have increased significantly. Control the brush by mechanical means or prescribed burning.
- Seed the range if the plant cover is not sufficient to protect the soil from erosion.

- Seed late in the fall for best results.
- After seeding, defer grazing until the young plants are well established.

Interpretive Groups

Land capability classification: **Kunz**—nonirrigated—7e; **Tuntsa**—nonirrigated—4c; **Yahmore**—nonirrigated—4e

Range site: **Kunz**—not assigned (forestland)

Tuntsa—Loamy Upland 18-22" p.z.; **Yahmore**—not assigned (forestland)

616—Ligai-Pastorpeak-Rock outcrop complex, 35 to 95 percent slopes

Setting

Landform: Mountains (fig. 15)

Position on the landform: **Ligai**—south-facing backslopes; **Pastorpeak**—north-facing backslopes; **Rock outcrop**—cliffs

Slope: **Ligai**—35 to 70 percent; **Pastorpeak**—50 to 95 percent

Shape of areas: Irregular

Size of areas: 100 to 10,000 acres

Elevation: **Ligai**—7,000 to 9,000 feet; **Pastorpeak**—7,500 to 9,000 feet

Mean annual precipitation: 14 to 18 inches

Mean annual air temperature: **Ligai**—45 to 48 degrees F; **Pastorpeak**—42 to 45 degrees F

Frost-free period: **Ligai**—120 to 140 days; **Pastorpeak**—100 to 120 days

Composition

Ligai extremely flaggy very fine sandy loam, extremely stony and similar soils: 40 percent

Pastorpeak very cobbly very fine sandy loam, extremely stony and similar soils: 35 percent

Rock outcrop: 10 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The moderately coarse textured Tuntsa soil on narrow footslopes covered by dense stands of Gambel oak trees
- Rubble land on very steeply sloping talus piles
- The shallow Arabrab soil on summits of ridges and dipslopes of cuestas
- The very deep, rubbly surface phase of the Tsezhin soil on alluvial cones
- Very deep, stratified soils and areas of stony or bouldery riverwash on frequently flooded valley floors



Figure 15.—A typical area of Ligai-Pastorpeak-Rock outcrop complex, 35 to 95 percent slopes, on the Carrizo Mountains in Arizona. The long, steep slopes and vertical cliffs prevent intensive use of this map unit. Twoneedle pinyon is the main tree species growing on the Ligai soil, whereas Douglas-fir is dominant on the Pastorpeak soil.

Characteristics of the Ligai Soil

Typical profile:

- 0 to 2 inches—reddish brown extremely flaggy very fine sandy loam
- 2 to 7 inches—reddish brown very flaggy sandy clay loam
- 7 to 25 inches—reddish brown very flaggy sandy clay loam and extremely flaggy sandy clay loam
- 25 inches—quartz diorite bedrock

Parent material: Colluvium and residuum derived from quartz diorite and sandstone

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Very low

Surface runoff: Rapid

Hazard of water erosion: Severe

Hazard of soil blowing: Very slight

Characteristics of the Pastorpeak Soil

Typical profile:

- Soil surface is covered by two inches of fir needles, twigs, and cones
- 0 to 4 inches—dark reddish gray very cobbly very fine sandy loam
- 4 to 38 inches—reddish brown very cobbly loam
- 38 to 64 inches—reddish brown extremely cobbly sandy loam
- 64 to 80 inches—angular quartz diorite fragments with some reddish brown sandy loam

Parent material: Colluvium and residuum derived from quartz diorite and sandstone

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate in the upper part and very rapid in the lower part

Available water capacity: Low to moderate

Surface runoff: Rapid

Hazard of water erosion: Severe

Hazard of soil blowing: Slight

Characteristics of Rock outcrop

Rock outcrop consists of exposures of diorite bedrock occurring dominantly as vertical cliffs and spires which are intermingled with the soils. It also occurs as knobs on the summits of ridges and as areas of sloping bedding planes on the rim of Chezhindeza Mesa. There is little or no vegetation, and surface runoff is rapid to very rapid.

Major Uses

Woodland production

Livestock grazing

Woodland production

Ligai soil

Dominant overstory vegetation:

pinyon (100%)

Average site index: 70

Overstory production (per acre):

fuelwood—11 to 13 cords in a stand of trees that averages 5 inches in diameter at a height of 1 foot; posts—0 to 5; Christmas trees—5 to 10; ornamental trees—30 to 40

Pastorpeak soil

Dominant overstory vegetation:

Douglas-fir (100%)

Average site index: 55

Overstory production per acre (commercial):

27 to 29 cubic feet or 165 to 175 board feet (Scribner rule) of timber from a stand of Douglas-fir trees 70 years old

Major limitations:

Ligai—hazard of water erosion, equipment limitations, seedling mortality, windthrow hazard, plant competition

Pastorpeak—hazard of water erosion, equipment limitations, seedling mortality, plant competition, low productivity

Suitable management practices and concerns:

- Snowpack and spring thaw limit the use of equipment and restrict access.
- The use of wheeled and tracked equipment in harvesting wood products or timber on these soils is severely restricted in most places because of the presence of slopes over 35 percent, numerous rock outcrops, and large surface stones.
- Road construction should be avoided on slopes greater than 60 percent.
- Remove the waste material resulting from road construction on moderate slopes to prevent damage

to downhill vegetation and reduce a potential source of stream sedimentation.

- Maintaining the understory vegetation is essential in controlling erosion.
- Droughtiness of the surface layers because of high content of rock fragments increases seedling mortality, especially on south- and southwest-facing slopes.
- Reduce the problem of seedling mortality by leaving some of the larger trees to provide shade for seedling trees.

Ligai soil

• Areas on summits of ridges that are exposed to strong, persistent winds are less productive than other areas.

• Tree seedlings have a low rate of survival because of high summer temperatures and the very low water holding capacity of the soil.

• Because roots are somewhat restricted by bedrock, trees have a moderate hazard of windthrow when the soil is excessively wet and winds are strong.

• To reduce the hazard of windthrow, avoid excessive cutting of trees, limit the width of maintained roads, and avoid making large openings in the canopy.

• Plant competition delays natural regeneration but it does not prevent the eventual development of a fully stocked, normal stand of trees.

Pastorpeak soil

• The potential is poor for harvesting commercial timber because of the small size and low productivity of the tree stands and the very steep slopes.

• Reduce the risk of water erosion by preventing excessive disturbance of the soil, by seeding cuts and fills, and by preventing harvesting the trees.

• Tree seedlings have a moderately low rate of survival because of the low to very low water holding capacity of the soil.

Livestock grazing

Ligai soil

Dominant understory vegetation in potential plant community:

muttongrass, black sagebrush, Utah serviceberry, Gambel oak, bottlebrush squirreltail, earth sedge, mountain snowberry, fendlerbush

Annual production of air-dry vegetation (pounds per acre):

Favorable years—400

Unfavorable years—200

Present understory plant community:

Gambel oak, Utah serviceberry, muttongrass, black sagebrush, bottlebrush squirreltail, earth sedge, mountain snowberry, fendlerbush

Pastorpeak soil

Dominant understory vegetation in potential plant community:

mountain snowberry, Gambel oak, common chokecherry, Utah serviceberry, nodding brome grass, rockspirea, littleleaf mockorange

Annual production of air-dry vegetation (pounds per acre):

Favorable years—500

Unfavorable years—200

Present understory plant community:

mountain snowberry, nodding brome grass, Gambel oak, common chokecherry, Utah serviceberry, rockspirea, littleleaf mockorange

Major limitations:

Ligai—hazard of water erosion, steep slopes, surface rock fragments, presence of rock outcrops

Pastorpeak—hazard of water erosion, steep slopes, surface rock fragments

Suitable management practices and concerns:

- Where the density of the canopy is less than about 30 percent, the understory produces plants suitable for grazing.
- Uniform distribution of grazing is difficult because of the slope.
- Livestock prefer to graze the easily accessible areas on adjacent map units, before they graze the steep slopes of this unit.
- Vary the season of grazing and the periods of rest during successive years.
- Control the time and amount of use by livestock.
- Reduce the risk of water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.
- To increase forage production, seed disturbed areas to suited grasses by broadcasting.
- Adequate site preparation is needed for successful seeding of understory plants.
- Seed late in the fall for best results.
- After seeding, defer grazing until the young plants are well established.
- The suitability for non-mechanized range seeding of grasses is fair because of soil factors.

Interpretive Groups

Land capability classification: **Ligai**—nonirrigated—7e; **Pastorpeak**—nonirrigated—7e; **Rock outcrop**—nonirrigated—8s

Range site: **Ligai**—not assigned (pinyon woodland); **Pastorpeak**—not assigned (forestland); **Rock outcrop**—not assigned

618—Zibetod-Bigpaw complex, 5 to 35 percent slopes

Setting

Landform: Mountain summits (fig. 16)

Position on the landform: **Zibetod**—footslopes and shoulders of domes; **Bigpaw**—toeslopes below domes

Slope: **Zibetod**—15 to 35 percent; **Bigpaw**—5 to 15 percent

Shape of areas: Irregular

Size of areas: 200 to 2,000 acres

Elevation: 8,500 to 9,400 feet

Mean annual precipitation: 18 to 20 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 80 to 100 days

Composition

Zibetod extremely cobbly very fine sandy loam, extremely stony and similar soils: 50 percent
Bigpaw loam and similar soils: 35 percent
Contrasting inclusions: 15 percent

Contrasting Inclusions

- Moderately deep soils on backslopes of domes under groves of Gambel oak
- The moderately deep Ligai soil on south-facing backslopes under stands of pinyon trees
- The very deep Pastorpeak soil on north-facing backslopes under stands of Douglas-fir and ponderosa pine
- Riverwash in wash channels and gullies

Characteristics of the Zibetod Soil

Typical profile:

- 0 to 2 inches—dark brown extremely cobbly very fine sandy loam
- 2 to 14 inches—dark brown and brown very cobbly very fine sandy loam and very cobbly fine sandy loam
- 14 inches—sandstone bedrock

Parent material: Residuum, alluvium, and eolian material derived from sandstone, siltstone, and quartz diorite

Depth class: Shallow

Drainage class: Well drained

Permeability: Moderately rapid

Available water capacity: Very low

Surface runoff: Rapid

Hazard of water erosion: Severe

Hazard of soil blowing: Very slight

Characteristics of the Bigpaw Soil

Typical profile:

- 0 to 5 inches—dark brown loam
- 5 to 48 inches—dark reddish brown and dark reddish gray loam
- 48 to 57 inches—reddish brown stony sandy clay loam
- 57 to 65 inches—light brown gravelly fine sandy loam

Parent material: Eolian material and alluvium derived from sandstone, siltstone, and quartz diorite

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: High to very high

Surface runoff: Medium

Hazard of water erosion: Very severe

Hazard of soil blowing: Slight

Major Uses

Livestock grazing

Zibetod soil

Dominant vegetation in potential plant community:

black sagebrush, muttongrass, bottlebrush squirreltail, Arizona fescue, Gambel oak, pinyon, ponderosa pine, trailing fleabane, hairy goldaster, senecio (groundsel), earth sedge

Annual production of air-dry vegetation (pounds per acre):

Favorable years—1,100

Unfavorable years—700

Present plant community:

senecio, bottlebrush squirreltail, black sagebrush, trailing fleabane, Gambel oak, muttongrass, hairy goldaster, ponderosa pine



Figure 16.—Bigpaw loam, in an area of Zibetod-Bigpaw complex, 5 to 35 percent slopes, on the summit of the Carrizo Mountains. Years of severe water erosion have degraded the soils on this map unit, creating an intricate network of rills and gullies. Black sagebrush and scattered Gambel oak trees are common plants growing on this map unit.

Bigpaw soil

Dominant vegetation in potential plant community:
western wheatgrass, black sagebrush, muttongrass,
bottlebrush squirreltail, Arizona fescue, Gambel
oak, common chokecherry, trailing fleabane,
senecio (groundsel)

*Annual production of air-dry vegetation (pounds per
acre):*

Favorable years—1,500

Unfavorable years—1,100

Present plant community:

black sagebrush, muttongrass, bottlebrush
squirreltail, trailing fleabane, senecio

Major limitations:

Zibetod—hazard of water erosion, depth to bedrock,
surface and subsurface rock fragments, slope,
very low available water capacity

Bigpaw—hazard of water erosion

Suitable management practices and concerns:

- Delay grazing until the soils are dry and firm enough to withstand trampling by livestock.
- Continuous, intensive summer grazing results in a deteriorated plant community that has low value as forage.
- Uniform distribution of grazing is difficult because of the slope, or the lack of permanent water developments, or both.
- Promote uniform grazing by fencing, properly locating salt licks, and proper stocking.
- Vary the season of grazing and the periods of rest during successive years.
- Control the time and amount of use by livestock.
- Reduce the risk of water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.
- Range seeding may be needed if the better forage plants have decreased.

Zibetod soil

- The suitability for mechanical range seeding is poor because of soil factors.

Bigpaw soil

- The suitability for mechanical range seeding is good.
- If shrubs are managed to create open areas, a good stand of desirable grasses and forbs can be produced.
- Manage the brush in areas where unpalatable brushy plants have increased significantly. Control the brush by mechanical means or prescribed burning.
- To increase forage production and help heal gullies caused by water erosion, seed disturbed areas to suited grasses by drilling or broadcasting.

- Adequate site preparation is needed for successful seeding of range plants.
- Seed late in the fall for best results.
- After seeding, defer grazing until the young plants are well established.

Interpretive Groups

Land capability classification: **Zibetod**—

nonirrigated—7s; **Bigpaw**—nonirrigated—4c

Range site: **Zibetod**—Sandstone Upland (cobbly) 17-20" p.z.; **Bigpaw**—Silty Upland 17-20" p.z.

700—Akhoni-Retaw complex, 0 to 15 percent slopes**Setting**

Landform: Undulating high plateaus and mesas

Position on the landform: **Akhoni**—summits; **Retaw**—rock basins (fig. 17)

Slope: **Akhoni**—1 to 15 percent; **Retaw**—0 to 1 percent

Shape of areas: Irregular

Size of areas: 200 to 2,000 acres

Elevation: 8,500 to 9,200 feet

Mean annual precipitation: 20 to 22 inches

Mean annual air temperature: 40 to 42 degrees F

Frost-free period: 80 to 100 days

Composition

Akhoni fine sandy loam and similar soils: 75 percent

Retaw muck and similar soils: 15 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- The very deep, somewhat poorly drained Bikeyah soil on small toeslopes
- The very shallow Berland soil on non-wooded knolls and benches
- The very deep, moderately coarse textured Klizhin soil on wooded footslopes
- Shallow soils similar to Akhoni with flaggy surfaces

Characteristics of the Akhoni Soil

Typical profile:

- Soil surface is covered by 1 inch of pine needles, cones, and twigs
- 0 to 3 inches—dark brown fine sandy loam
- 3 to 17 inches—dark brown and brown fine sandy loam
- 17 inches—sandstone bedrock

Parent material: Alluvium and residuum derived from sandstone



Figure 17.—Retaw muck, in an area of Akhoni-Retaw complex, 0 to 15 percent slopes, on the summit of the Chuska Mountains. This soil is typically covered by shallow standing water and provides habitat for wetland wildlife. Hydrophytic vegetation, such as northern mannagrass and needle spikerush, grows on the Retaw soil. Ponderosa pine is present on the Akhoni soil in the background.

Depth class: Shallow
Drainage class: Well drained
Permeability: Moderately rapid
Available water capacity: Very low
Surface runoff: Medium
Hazard of water erosion: Moderate
Hazard of soil blowing: Severe

Characteristics of the Retaw Soil

Typical profile:

- 0 to 3 inches—black muck
 - 3 to 8 inches—black mucky silt loam
 - 8 to 13 inches—black mucky silty clay loam
 - 13 to 33 inches—dark gray and gray stratified fine sandy loam to silty clay
 - 33 to 70 inches—grayish brown and light olive brown stratified loamy sand to sandy clay loam
- Parent material:* Lacustrine sediments and alluvium derived from sandstone

Depth class: Very deep
Drainage class: Very poorly drained
Permeability: Very slow
Available water capacity: High to very high
Surface runoff: Pondered
Hazard of water erosion: None
Hazard of soil blowing: Very slight
Depth of seasonal surface water: 0 to 4.0 feet

Major Uses

Timber production
 Livestock grazing

Timber production

Akhoni soil

Dominant overstory vegetation:
 ponderosa pine (100%)
Average site index: 80

Overstory production per acre (commercial):

68 to 70 cubic feet or 410 to 420 board feet (Scribner rule) of timber from a stand of ponderosa pine trees 40 years old

Major limitations: hazard of soil blowing, hazard of water erosion, seedling mortality, windthrow hazard

Suitable management practices and concerns:

- Manage the stands of ponderosa pine for a combination of uses, including wood production.
- Snowpack and spring thaw limit the use of equipment and restrict access.
- Unsurfaced roads and skid trails are muddy when wet. They may be impassable during rainy periods.
- Roads may require ballast for use during logging operations.
- Adequately designed road drainage reduces the risk of water erosion.
- Restrict the use of wheeled and tracked equipment to periods when the soil is dry or frozen to prevent ruts, reduce compaction and subsequent water erosion, and prevent damage to the roots of trees.
- To help prevent soil compaction, use suitable methods of harvest and lay out skid trails well in advance.
- The careful use of wheeled and tracked equipment will help preserve the protective layer of duff on the soil surface.
- Maintaining the understory vegetation is essential in controlling erosion.
- Reduce the risk of water erosion and soil blowing by preventing excessive disturbance of the soil; seeding roads, cutbanks, and landings; and installing water bars and culverts.
- Limit the temperature of burning slash piles to prevent heat damage to duff layers and mineral soil surfaces.
- Improve stands by thinning before trees reach commercial size and by selective cutting of mature trees.
- Areas on open summits that are exposed to strong, persistent winds are less productive than other areas.
- If healthy seed trees are left in a stand, reforestation will occur naturally in cutover areas.
- Reduce the problem of seedling mortality by leaving some of the larger trees to provide shade for seedling trees.
- Tree seedlings may become stunted and misshapen because of intensive grazing by sheep and goats during the summer.
- Because roots are restricted by bedrock, trees have a severe hazard of windthrow when the soil is excessively wet and winds are strong.

- To reduce the hazard of windthrow, avoid excessive cutting of trees, limit the width of maintained roads, and avoid making large openings in the canopy.

Livestock grazing**Akhoni soil**

Dominant understory vegetation in potential plant community:

Kentucky bluegrass, earth sedge, bottlebrush squirreltail, mountain muhly, bottlebrush squirreltail, Gambel oak, western yarrow, wild strawberry, pussytoes, fleabane

Annual production of air-dry vegetation (pounds per acre):

Favorable years—800

Unfavorable years—300

Present understory plant community:

Kentucky bluegrass, earth sedge, bottlebrush squirreltail, pine dropseed, pussytoes, fleabane

Retaw soil

Dominant vegetation in potential plant community:

northern mangrass, floatingleaf pondweed, needle spikerush, mare's-tail, three-square bulrush

Annual production of air-dry vegetation (pounds per acre):

Normal years—2,000

Major limitations:

Akhoni—hazard of soil blowing, hazard of water erosion, depth to bedrock

Retaw—ponded surface water

Suitable management practices and concerns:

Akhoni soil

- Where the density of the canopy is less than about 50 percent, the understory produces plants suitable for grazing.
- Vary the season of grazing and the periods of rest during successive years.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.
- To increase forage production, seed disturbed areas to suited grasses by broadcasting.
- Adequate site preparation is needed for successful seeding of understory plants.
- Seed late in the fall for best results.
- After seeding, defer grazing until the young grasses and tree seedlings are well established.
- The suitability for non-mechanized range seeding of grasses is fair because of soil factors.

Retaw soil

- Unique wetland plants attract waterfowl for food and nesting.

- These areas also furnish wetland wildlife habitat for many species of mammals, fish, amphibians, and invertebrates.
- Livestock graze wetland areas where surface water depth is less than three feet deep.
- Continuous, intensive summer grazing results in the loss of wetland wildlife habitat.
- Control the time and amount of use on wetland areas by livestock to enhance wildlife habitat.

Interpretive Groups

Land capability classification: **Akhoni**—nonirrigated—7s; **Retaw**—nonirrigated—5w
Range site: **Akhoni**—not assigned (forestland); **Retaw**—Wetland

702—Bikeyah-Berland loams, 1 to 15 percent slopes

Setting

Landform: Open valleys on undulating high plateaus
Position on the landform: **Bikeyah**—toeslopes; **Berland**—knolls and structural benches
Slope: **Bikeyah**—1 to 15 percent; **Berland**—1 to 15 percent
Shape of areas: Irregular
Size of areas: 20 to 500 acres
Elevation: 8,400 to 9,200 feet
Mean annual precipitation: 20 to 22 inches
Mean annual air temperature: 40 to 42 degrees F
Frost-free period: 80 to 100 days

Composition

Bikeyah soil and similar soils: 45 percent
 Berland soil and similar soils: 40 percent
 Contrasting inclusions: 15 percent

Contrasting Inclusions

- The very poorly drained Retaw soil on small rock basins covered with standing water
- Rock outcrop as exposures of sandstone bedrock occurring as small cliffs below summits of structural benches
- The shallow Akhoni soil on small wooded summits
- Occasionally flooded, moderately fine textured soils on narrow flood plains

Characteristics of the Bikeyah Soil

Typical profile:

- 0 to 5 inches—dark gray loam

- 5 to 14 inches—dark gray loam
- 14 to 29 inches—dark grayish brown and grayish brown fine sandy loam
- 29 to 65 inches—light gray sandy loam

Parent material: Alluvium derived from sandstone

Depth class: Very deep

Drainage class: Somewhat poorly drained

Permeability: Moderate

Available water capacity: Moderate to high

Surface runoff: Medium

Hazard of water erosion: Very severe

Hazard of soil blowing: Slight

Depth to seasonal high water table: 2.0 to 3.5 feet

Characteristics of the Berland Soil

Typical profile:

- 0 to 2 inches—brown loam
- 2 to 9 inches—dark brown loam and sandy clay loam
- 9 inches—sandstone bedrock

Parent material: Alluvium derived from sandstone

Depth class: Very shallow

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Very low

Surface runoff: Rapid

Hazard of water erosion: Very severe

Hazard of soil blowing: Moderate

Major Uses

Livestock grazing

Bikeyah soil

Dominant vegetation in potential plant community: sedges, redtop, western wheatgrass, timothy, western yarrow, silverweed cinquefoil

Annual production of air-dry vegetation (pounds per acre):

Favorable years—3,500

Unfavorable years—2,500

Present plant community:

Kentucky bluegrass, smooth brome, sedges, timothy, western yarrow

Berland soil

Dominant vegetation in potential plant community: mountain muhly, blue grama, Arizona fescue, needleleaf sedge, prairie junegrass, pussytoes, silverweed cinquefoil, Louisiana sagewort

Annual production of air-dry vegetation (pounds per acre):

Favorable years—1,200

Unfavorable years—800

Present plant community:

Kentucky bluegrass, prairie junegrass, needleleaf sedge, blue grama, crested wheatgrass, pussytoes

Major limitations:

Bikeyah—hazard of water erosion

Berland—hazard of water erosion, hazard of soil blowing, depth to bedrock, very low available water capacity

Suitable management practices and concerns:

- Delay grazing until the soils are dry and firm enough to withstand trampling by livestock.
- Continuous, intensive summer grazing results in a deteriorated plant community that has low value as forage.
- Promote uniform grazing by fencing, properly distributing salt licks, and proper stocking.
- Control the time and amount of use by livestock.
- Provide periodic rest during summer in alternate years.
- Reduce the risk of water erosion and soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.
- Range seeding may be needed if the better forage plants have decreased.

Bikeyah soil

- The suitability for range seeding is good.
- To increase forage production, seed disturbed areas to suited grasses by drilling or broadcasting.
- Adequate site preparation is needed for successful seeding of plants.
- Seed late in the fall for best results.
- After seeding, defer grazing until the young grasses are well established.

Berland soil

- The suitability for range seeding is poor because of soil factors.

Interpretive Groups

Land capability classification: **Bikeyah**—nonirrigated—6e; **Berland**—nonirrigated—7s

Range site: **Bikeyah**—Meadow 18-22" p.z.;

Berland—Shallow Loamy 18-22" p.z.

704—Klizhin-Captom complex, 15 to 60 percent slopes

Setting

Landform: High plateaus and mesas

Position on the landform: **Klizhin**—footslopes;

Captom—backslopes

Slope: **Klizhin**—15 to 35 percent; **Captom**—35 to 60 percent

Shape of areas: Elongate

Size of areas: 50 to 500 acres

Elevation: 8,500 to 9,200 feet

Mean annual precipitation: 20 to 22 inches

Mean annual air temperature: 40 to 42 degrees F

Frost-free period: 80 to 100 days

Composition

Klizhin fine sandy loam and similar soils: 45 percent

Captom very flaggy loamy sand and similar soils: 35 percent

Contrasting inclusions: 20 percent

Contrasting Inclusions

- The shallow Akhoni soil on summits of small mesas and structural benches
- The somewhat poorly drained Bikeyah soil on small non-wooded toeslopes
- The coarse textured Bangston soil on steep, north-facing backslopes
- Rock outcrop as exposures of sandstone bedrock on small cliffs

Characteristics of the Klizhin Soil

Typical profile:

- Soil surface is covered by two inches of pine needles, cones, and twigs
- 0 to 4 inches—dark gray fine sandy loam
- 4 to 49 inches—very dark gray, dark gray, and grayish brown fine sandy loam
- 49 to 56 inches—pinkish gray loamy sand
- 56 to 64 inches—light brown sandy loam

Parent material: Alluvium derived from sandstone

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately rapid

Available water capacity: Moderate to high

Surface runoff: Medium

Hazard of water erosion: Moderate

Hazard of soil blowing: Slight

Characteristics of the Captom Soil

Typical profile:

- Soil surface is covered by two inches of oak leaves, pine needles, and twigs
- 0 to 8 inches—dark brown very flaggy loamy sand
- 8 to 13 inches—pinkish gray very channery loamy sand
- 13 to 32 inches—light brown channery loamy sand
- 32 to 43 inches—reddish brown sandy clay loam
- 43 to 58 inches—reddish yellow sandy loam
- 58 inches—soft sandstone bedrock

Parent material: Colluvium and residuum derived from sandstone

Depth class: Deep

Drainage class: Well drained

Permeability: Rapid in the upper part and moderate and moderately rapid in the lower part

Available water capacity: Low to moderate

Surface runoff: Rapid

Hazard of water erosion: Severe

Hazard of soil blowing: Slight

Major Uses

Timber production

Livestock grazing

Timber production

Klizhin soil

Dominant overstory vegetation:

ponderosa pine (50%), quaking aspen (35%), Douglas-fir (15%)

Average site index:

ponderosa pine—83

quaking aspen—62

Douglas-fir—71

Overstory production per acre (commercial):

- ponderosa pine—73 to 75 cubic feet or 440 to 450 board feet (Scribner rule) of timber from a stand of trees 40 years old;

- quaking aspen—33 to 35 cubic feet or 200 to 210 board feet (Scribner rule) of timber from a stand of trees 80 years old;

- Douglas-fir—46 to 48 cubic feet or 280 to 290 board feet (Scribner rule) of timber from a stand of trees 70 years old

Captom soil

Dominant overstory vegetation:

ponderosa pine (100%)

Average site index: 82

Overstory production per acre (commercial):

74 to 76 cubic feet or 445 to 455 board feet (Scribner rule) of timber from a stand of ponderosa pine trees 40 years old

Major limitations:

Klizhin—hazard of water erosion, equipment limitations, plant competition

Captom—hazard of water erosion, equipment limitations, seedling mortality, plant competition

Suitable management practices and concerns:

- Manage the stands of trees for a combination of uses, including wood production.
- Snowpack and spring thaw limit the use of equipment and restrict access.
- Unsurfaced roads and skid trails are muddy when wet. They may be impassable during rainy periods.

- Roads may require ballast for use during logging operations.

- Adequately designed road drainage reduces the risk of water erosion.

- Remove the waste material resulting from road construction on moderate slopes to prevent damage to downhill vegetation and reduce a potential source of stream sedimentation.

- The careful use of wheeled and tracked equipment will help preserve the protective layers of duff on the soil surfaces.

- Maintaining the understory vegetation is essential in controlling erosion.

- Reduce the risk of water erosion by preventing excessive disturbance of the soils; seeding roads, cutbanks, and landings; installing water bars and culverts; and seeding cuts and fills.

- Use water bars and plant covers on steep yarding paths, skid trails, and firebreaks to control rilling and gullyng.

- Limit the temperature of burning slash piles to prevent heat damage to duff layers and mineral soil surfaces.

- If healthy seed trees are left in a stand, reforestation will occur naturally in cutover areas.

- Improve stands by thinning before trees reach commercial size and by selective cutting of mature trees.

- Reduce the problem of competition from unwanted plants by preventing the over-harvest of trees.

Klizhin soil

- The use of wheeled and tracked equipment in harvesting timber on this soil is moderately restricted in most places because of the presence of slopes over 15 percent.

- Restrict the use of wheeled and tracked equipment to periods when the soil is dry or frozen to prevent ruts, reduce compaction and subsequent water erosion, and prevent damage to the roots of trees.

- To help prevent soil compaction, use suitable methods of harvest and lay out skid trails well in advance.

- Plant competition can be controlled by properly preparing the site and by cutting or girdling to eliminate unwanted weeds, brush, or trees.

Captom soil

- The use of wheeled and tracked equipment in harvesting timber on this soil is severely restricted in most places because of the presence of slopes over 35 percent.

- Droughtiness of the surface layer because of sandy textures increases seedling mortality, especially on south- and southwest-facing slopes.

- Reduce the problem of seedling mortality by

leaving some of the larger trees to provide shade for seedling trees.

- Mulch with duff or small slash around tree seedlings to retain soil moisture and help alleviate seedling mortality.
- Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees.

Livestock grazing

Klizhin soil

Dominant understory vegetation in potential plant community:

Kentucky bluegrass, earth sedge, geranium, Oregongrape, kinnikinnick, rose, pussytoes, common juniper

Annual production of air-dry vegetation (pounds per acre):

Favorable years—600

Unfavorable years—200

Present understory plant community:

earth sedge, Kentucky bluegrass, geranium, pussytoes, Oregongrape

Captom soil

Dominant understory vegetation in potential plant community:

earth sedge, Gambel oak, Kentucky bluegrass, bottlebrush squirreltail, Oregongrape, nodding brome

Annual production of air-dry vegetation (pounds per acre):

Favorable years—600

Unfavorable years—200

Present understory plant community:

Gambel oak, earth sedge, bottlebrush squirreltail, Kentucky bluegrass, silvery lupine, Oregongrape

Major limitations:

Klizhin—hazard of water erosion, moderate slopes

Captom—hazard of water erosion, steep slopes, surface rock fragments, very low water holding capacity in the surface and subsurface

Suitable management practices and concerns:

- Where the density of the canopy is less than about 50 percent, the understory produces plants suitable for grazing.
- Uniform distribution of grazing is difficult because of the slope or the lack of permanent water developments, or both.
- Livestock prefer to graze the easily accessible areas before they graze the steep slopes.
- Vary the season of grazing and the periods of rest during successive years.
- Control the time and amount of use by livestock.
- Reduce the risk of water erosion by preventing

overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

- To increase forage production, seed disturbed areas to suited grasses by broadcasting.
- Adequate site preparation is needed for successful seeding of understory plants.
- Seed late in the fall for best results.
- After seeding, defer grazing until the young grasses and tree seedlings are well established.

Klizhin soil

• The suitability for non-mechanized range seeding of grasses is fair because of soil factors.

Captom soil

• The suitability for non-mechanized range seeding of grasses is poor because of soil factors.

Interpretive Groups

Land capability classification: **Klizhin**—

nonirrigated—6e; **Captom**—nonirrigated—7e

Range site: **Klizhin**—not assigned (forestland);

Captom—not assigned (forestland)

706—Todacheene-Viewpoint-Owlspring association, 1 to 20 percent slopes

Setting

Landform: Mesas and calderas (fig. 18)

Position on the landform: **Todacheene**—footslopes and fan terraces; **Viewpoint**—shoulders and knolls; **Owlspring**—toeslopes

Slope: **Todacheene**—5 to 20 percent; **Viewpoint**—2 to 20 percent; **Owlspring**—1 to 10 percent

Shape of areas: Irregular to rounded

Size of areas: 200 to 2,000 acres

Elevation: 8,500 to 9,000 feet

Mean annual precipitation: 20 to 22 inches

Mean annual air temperature: 40 to 42 degrees F

Frost-free period: 80 to 100 days

Composition

Todacheene loam and similar soils: 35 percent

Viewpoint gravelly loam, very stony and similar soils: 35 percent

Owlspring loam and similar soils: 20 percent

Contrasting inclusions: 10 percent

Contrasting Inclusions

- About 5 percent poorly drained hydric soils similar to the Canburn soil, on narrow flood plains
- The extremely cobbly Sonsela soil on wooded backslopes
- Rock outcrop as exposures of basalt bedrock occurring on small ledges and on knobs



Figure 18.—A typical area of Todacheene-Viewpoint-Owlspring association, 1 to 20 percent slopes, at Narbona Pass in New Mexico. Narbona Pass is one of several places in the Chuska Mountains which have soils that formed in materials derived from volcanic rocks. Sonsela-Washpass-Viewpoint complex, 20 to 70 percent slopes, is on the steep hills in the background.

Characteristics of the Todacheene Soil

Typical profile:

- 0 to 2 inches—very dark gray loam
- 2 to 18 inches—very dark gray loam
- 18 to 37 inches—reddish brown sandy clay loam and fine sandy loam
- 37 to 80 inches—brown gravelly sandy loam and very gravelly coarse sandy loam

Parent material: Alluvium derived from basalt and basaltic tuff

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Moderate to high

Surface runoff: Medium

Hazard of water erosion: Very severe

Hazard of soil blowing: Slight

Characteristics of the Viewpoint Soil

Typical profile:

- Soil surface is covered by 1 inch of pine needles, cones, and twigs
- 0 to 3 inches—dark brown gravelly loam
- 3 to 7 inches—dark brown gravelly sandy clay loam
- 7 to 17 inches—dark brown cobbly sandy clay loam
- 17 inches—basalt bedrock

Parent material: Alluvium and residuum derived from basalt

Depth class: Shallow

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Very low

Surface runoff: Medium

Hazard of water erosion: Moderate

Hazard of soil blowing: Moderate

Characteristics of the Owlspring Soil

Typical profile:

- 0 to 5 inches—dark brown loam
- 5 to 25 inches—dark reddish brown and very dark gray loam and clay loam
- 25 to 43 inches—dark reddish gray and pinkish gray sandy clay loam
- 43 to 66 inches—brown fine sandy loam
- 66 to 72 inches—pale brown gravelly sandy loam
- 72 to 81 inches—light brownish gray and strong brown very fine sandy loam
- 81 inches—soft basaltic tuff bedrock

Parent material: Alluvium and residuum derived from basalt and basaltic tuff

Depth class: Very deep

Drainage class: Somewhat poorly drained

Permeability: Moderately slow

Available water capacity: High

Surface runoff: Medium

Hazard of water erosion: Severe

Hazard of soil blowing: Severe

Flooding frequency: Frequent, very brief periods

Depth to seasonal high water table: 2.0 to 3.5 feet

Major Uses

Livestock grazing

Timber production

Livestock grazing

Todacheene soil

Dominant vegetation in potential plant community:

Arizona fescue, needleleaf sedge, bottlebrush squirreltail, blue grama, silvery lupine, pingue, pussytoes

Annual production of air-dry vegetation (pounds per acre):

Favorable years—1,500

Unfavorable years—1,200

Present plant community:

Kentucky bluegrass, bottlebrush squirreltail, needleleaf sedge, pingue, silvery lupine

Viewpoint soil

Dominant understory vegetation in potential plant community:

earth sedge, Kentucky bluegrass, muttongrass, bottlebrush squirreltail, Gambel oak, Oregongrape, pingue

Annual production of air-dry vegetation (pounds per acre):

Favorable years—800

Unfavorable years—300

Present understory plant community:

Kentucky bluegrass, bottlebrush squirreltail, Gambel oak, pingue, Oregongrape

Owlspring soil

Dominant vegetation in potential plant community:

tufted hairgrass, redtop, Baltic rush, Rocky Mountain iris, slender wheatgrass, needleleaf sedge, pussytoes, western yarrow

Annual production of air-dry vegetation (pounds per acre):

Favorable years—3,500

Unfavorable years—2,500

Present plant community:

Kentucky bluegrass, redtop, needleleaf sedge, Rocky Mountain iris, western yarrow, common dandelion

Major limitations:

Todacheene—hazard of water erosion

Viewpoint—hazard of water erosion, hazard of soil blowing, depth to bedrock, surface rock fragments, very low available water capacity

Owlspring—hazard of water erosion

Suitable management practices and concerns:

- Delay grazing until the soils are dry and firm enough to withstand trampling by livestock.
- Continuous, intensive summer grazing results in a deteriorated plant community that has low value as forage.
- Vary the season of grazing and the periods of rest during successive years.
- Control the time and amount of use by livestock.
- Reduce the risk of water erosion and soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

Todacheene and Owlspring soils

- If trees and shrubs are managed to create open areas, a good stand of plants suitable for use as forage can be produced.
- The suitability for mechanical range seeding is good.
- To increase forage production, seed disturbed areas to suited grasses by drilling.
- Adequate site preparation is needed for successful seeding of plants.
- Seed late in the fall for best results.
- After seeding, defer grazing until the young grasses are well established.

Viewpoint soil

- Where the density of the canopy is less than about 40 percent, the understory produces plants suitable for grazing.
- The suitability for non-mechanized range seeding of grasses is fair because of soil factors.

- To increase forage production, seed disturbed areas to suited grasses by broadcasting.
- Seed late in the fall for best results.
- After seeding, defer grazing until the young grasses and tree seedlings are well established.

Timber production

Viewpoint soil

Dominant overstory vegetation:

ponderosa pine (100%)

Average site index: 80

Overstory production per acre (commercial):

68 to 70 cubic feet or 410 to 420 board feet (Scribner rule) of timber from a stand of ponderosa pine trees 40 years old

Major limitations:

Viewpoint—hazard of water erosion, hazard of soil blowing, equipment limitations, seedling mortality, windthrow hazard

Suitable management practices and concerns:

- Manage the stands of ponderosa pine for a combination of uses, including wood production.
- Snowpack and spring thaw limit the use of equipment and restrict access.
- Unsurfaced roads and skid trails are muddy when wet. They may be impassable during rainy periods.
- Roads may require ballast for use during logging operations.
- Adequately designed road drainage reduces the risk of water erosion.
- Restrict the use of wheeled and tracked equipment to periods when the soil is dry or frozen to prevent ruts, reduce compaction and subsequent water erosion, and prevent damage to the roots of trees.
- To help prevent soil compaction, use suitable methods of harvest and lay out skid trails well in advance.
- The careful use of wheeled and tracked equipment will help preserve the protective layer of duff on the soil surface.
- Maintaining the understory vegetation is essential in controlling erosion.
- Reduce the risk of water erosion and soil blowing by preventing excessive disturbance of the soil; seeding roads, cutbanks, and landings; and installing water bars and culverts.
- Limit the temperature of burning slash piles to prevent heat damage to duff layers and mineral soil surfaces.
- If healthy seed trees are left in a stand, reforestation will occur naturally in cutover areas.
- Improve stands by thinning before trees reach commercial size and by selective cutting of mature trees.

- Rock outcrops cause breakage of timber and hinder yarding.
- The use of wheeled and tracked equipment in harvesting timber on this soil is moderately restricted in some places because of the presence of slopes over 15 percent and large surface stones.
- Reduce the problem of seedling mortality by leaving some of the larger trees to provide shade for seedling trees.
- Mulch with duff or small slash around tree seedlings to retain soil moisture and help alleviate seedling mortality.
- Tree seedlings may become stunted and misshapen because of intensive grazing by sheep and goats during the summer.
- Because roots are restricted by bedrock, trees have a severe hazard of windthrow when the soil is excessively wet and winds are strong.
- To reduce the hazard of windthrow, avoid excessive cutting of trees, limit the width of maintained roads, and avoid making large openings in the canopy.

Interpretive Groups

Land capability classification: **Todacheene**—

nonirrigated—4c; **Viewpoint**—nonirrigated—7s;

Owlspring—nonirrigated—4c

Range site: **Todacheene**—Loamy Upland;

Viewpoint—not assigned (forestland);

Owlspring—Meadow 18-22" p.z.

708—Tunitcha-Bangston association, 35 to 60 percent slopes

Setting

Landform: Backslopes of high plateaus, mesas, and structural benches

Position on the landform: **Tunitcha**—south-facing backslopes; **Bangston**—north-facing backslopes

Slope: **Tunitcha**—45 to 60 percent; **Bangston**—35 to 50 percent

Shape of areas: Irregular

Size of areas: 100 to 3,000 acres

Elevation: 8,500 to 9,200 feet

Mean annual precipitation: 20 to 24 inches

Mean annual air temperature: 39 to 41 degrees F

Frost-free period: 60 to 90 days

Composition

Tunitcha very flaggy sandy loam and similar soils: 45 percent

Bangston loamy sand and similar soils: 40 percent

Contrasting inclusions: 15 percent

Contrasting Inclusions

- The moderately coarse textured Klizhin soils on footslopes
- The shallow Akhoni soil on narrow structural benches

Characteristics of the Tunitcha Soil

Typical profile:

- Soil surface is covered by 1 inch of pine needles, twigs, and cones
- 0 to 5 inches—dark grayish brown very flaggy sandy loam
- 5 to 8 inches—brown flaggy sandy loam
- 8 to 38 inches—reddish brown and brown sandy clay loam
- 38 to 57 inches—white and light brown sandy loam
- 57 inches—soft sandstone bedrock

Parent material: Colluvium and residuum derived from sandstone

Depth class: Deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Moderate

Surface runoff: Rapid

Hazard of water erosion: Severe

Hazard of soil blowing: Slight

Characteristics of the Bangston Soil

Typical profile:

- Soil surface is covered by 1 inch of fir needles, cones, and twigs
- 0 to 7 inches—dark grayish brown loamy sand
- 7 to 26 inches—dark grayish brown and brown loamy sand
- 26 to 43 inches—brown flaggy loamy sand
- 43 to 66 inches—light yellowish brown very flaggy loamy sand

Parent material: Alluvium and colluvium derived from sandstone

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Rapid

Available water capacity: Very low to low

Surface runoff: Rapid

Hazard of water erosion: Very severe

Hazard of soil blowing: Moderate

Major Uses

Timber production
Livestock grazing

Timber production

Tunitcha soil

Dominant overstory vegetation:

ponderosa pine (80%), Douglas-fir (15%), quaking aspen (5%)

Average site index:

ponderosa pine—82

Douglas-fir—71

quaking aspen—79

Overstory production per acre (commercial):

- ponderosa pine—71 to 73 cubic feet or 425 to 440 board feet (Scribner rule) of timber from a stand of trees 40 years old;
- Douglas-fir—46 to 48 cubic feet or 280 to 290 board feet (Scribner rule) of timber from a stand of trees 70 years old;
- quaking aspen—46 to 48 cubic feet or 275 to 285 board feet (Scribner rule) of timber from a stand of trees 100 years old

Bangston soil

Dominant overstory vegetation:

corkbark fir (45%), quaking aspen (30%), Douglas-fir (20%), ponderosa pine (5%)

Average site index:

corkbark fir—84

quaking aspen—79

Douglas-fir—71

ponderosa pine—79

Overstory production per acre (commercial):

- corkbark fir—81 to 83 cubic feet or 485 to 495 board feet (Scribner rule) of timber from a stand of trees 100 years old;
- quaking aspen—46 to 48 cubic feet or 275 to 285 board feet (Scribner rule) of timber from a stand of trees 100 years old;
- Douglas-fir—46 to 48 cubic feet or 280 to 290 board feet (Scribner rule) of timber from a stand of trees 70 years old;
- ponderosa pine—66 to 68 cubic feet or 395 to 405 board feet (Scribner rule) of timber from a stand of trees 50 years old

Major limitations:

Tunitcha—hazard of water erosion, equipment limitations, seedling mortality, plant competition

Bangston—hazard of water erosion, hazard of soil blowing, equipment limitations, seedling mortality, plant competition

Suitable management practices and concerns:

- Manage the stands of trees for a combination of uses, including wood production.

- Snowpack and spring thaw limit the use of equipment and restrict access.
- Unsurfaced roads and skid trails are muddy when wet. They may be impassable during rainy periods.
- Roads may require ballast for use during logging operations.
- Adequately designed road drainage reduces the risk of water erosion.
- Remove the waste material resulting from road construction on steep slopes to prevent damage to downhill vegetation and reduce a potential source of stream sedimentation.
- The use of wheeled and tracked equipment in harvesting timber on these soils is severely restricted in most places because of the presence of slopes over 35 percent.
- Restrict the use of wheeled and tracked equipment to periods when the soils are dry or frozen to prevent ruts, reduce compaction and subsequent water erosion, and prevent damage to the roots of trees.
- The careful use of wheeled and tracked equipment will help preserve the protective layers of duff on the soil surfaces.
- Maintaining the understory vegetation is essential in controlling erosion.
- Reduce the risk of water erosion and soil blowing by preventing excessive disturbance of the soils; seeding roads, cutbanks, and landings; installing water bars and culverts; and seeding cuts and fills.
- Use water bars and plant covers on steep yarding paths, skid trails, and firebreaks to control rilling and gullyng.
- Improve stands by thinning before trees reach commercial size, and by selective cutting of mature trees.
- If healthy seed trees are left in a stand, reforestation will occur naturally in cutover areas.
- Reduce the problem of seedling mortality by leaving some of the larger trees to provide shade for seedling trees.
- Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees.
- Reduce the problem of competition from unwanted plants by preventing the over-harvest of trees.

Livestock grazing

Tunitcha soil

Dominant understory vegetation in potential plant community:

Gambel oak, earth sedge, nodding brome grass, bottlebrush squirreltail, silvery lupine, Oregon grape

Annual production of air-dry vegetation (pounds per acre):

Favorable years—600

Unfavorable years—200

Present understory plant community:

Gambel oak, earth sedge, nodding brome grass, Arizona fescue, silvery lupine, Oregon grape

Bangston soil

Dominant understory vegetation in potential plant community:

mountain snowberry, earth sedge, western brackenfern, Kentucky bluegrass, Gambel oak, Rocky Mountain maple, Oregon grape, nodding brome grass

Annual production of air-dry vegetation (pounds per acre):

Favorable years—500

Unfavorable years—100

Present understory plant community:

nodding brome grass, Kentucky bluegrass, earth sedge, western yarrow, mountain snowberry, common chokecherry

Major limitations:

Tunitcha—hazard of water erosion, steep slopes, surface rock fragments

Bangston—hazard of water erosion, hazard of soil blowing, steep slopes, lingering snowpack

Suitable management practices and concerns:

- Where the density of the canopy is less than about 60 percent, the understory produces plants suitable for grazing.
- Uniform distribution of grazing is difficult because of the slope or the lack of permanent water developments, or both.
- Livestock prefer to graze the easily accessible areas on adjacent map units before they graze the steep slopes of this unit.
- Vary the season of grazing and the periods of rest during successive years.
- Control the time and amount of use by livestock.
- Reduce the risk of water erosion and soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.
- To increase forage production, seed disturbed areas to suited grasses by broadcasting.
- The suitability for non-mechanized range seeding of grasses is fair because of soil factors.
- Adequate site preparation is needed for successful seeding of understory plants.
- Seed late in the fall for best results.
- After seeding, defer grazing until the young grasses and tree seedlings are well established.

Interpretive Groups

Land capability classification: **Tunitcha**—nonirrigated—7e; **Bangston**—nonirrigated—7e
Range site: **Tunitcha**—not assigned (forestland);
Bangston—not assigned (forestland)

710—Akhoni-Klizhin fine sandy loams, 1 to 35 percent slopes

Setting

Landform: High plateaus, mesas, and structural benches
Position on the landform: **Akhoni**—summits;
Klizhin—footslopes
Slope: **Akhoni**—1 to 15 percent; **Klizhin**—10 to 35 percent
Shape of areas: Irregular
Size of areas: 50 to 1,000 acres
Elevation: 8,800 to 9,200 feet
Mean annual precipitation: 22 to 24 inches
Mean annual air temperature: 39 to 41 degrees F
Frost-free period: 70 to 90 days

Composition

Akhoni soil and similar soils: 55 percent
 Klizhin soil and similar soils: 30 percent
 Contrasting inclusions: 15 percent

Contrasting Inclusions

- The very poorly drained Retaw soil on small rock basins covered with standing water
- The very deep, coarse textured Bangston soil on north-facing backslopes
- The moderately fine textured Tunitcha soil on south-facing backslopes

Characteristics of the Akhoni Soil

Typical profile:

- Soil surface is covered by 1 inch of pine needles, twigs, and oak leaves
- 0 to 2 inches—dark brown fine sandy loam
- 2 to 13 inches—dark brown and brown fine sandy loam
- 13 inches—sandstone bedrock

Parent material: Alluvium and residuum derived from sandstone

Depth class: Shallow

Drainage class: Well drained

Permeability: Moderately rapid

Available water capacity: Very low

Surface runoff: Medium

Hazard of water erosion: Moderate

Hazard of soil blowing: Severe

Characteristics of the Klizhin Soil

Typical profile:

- Soil surface is covered by 1 inch of pine needles, twigs, and oak leaves
- 0 to 7 inches—dark brown fine sandy loam
- 7 to 22 inches—dark brown fine sandy loam
- 22 to 45 inches—brown sandy loam
- 45 inches—sandstone bedrock

Parent material: Alluvium and residuum derived from sandstone

Depth class: Deep

Drainage class: Well drained

Permeability: Moderately rapid

Available water capacity: Moderate

Surface runoff: Medium

Hazard of water erosion: Severe

Hazard of soil blowing: Moderate

Major Uses

Timber production

Livestock grazing

Timber production

Akhoni soil

Dominant overstory vegetation:

ponderosa pine (60%), Douglas-fir (20%), quaking aspen (20%)

Average site index:

ponderosa pine—80

Douglas-fir—71

quaking aspen—79

Overstory production per acre (commercial):

• ponderosa pine—68 to 70 cubic feet or 410 to 420 board feet (Scribner rule) of timber from a stand of trees 40 years old;

• Douglas-fir—46 to 48 cubic feet or 280 to 290 board feet (Scribner rule) of timber from a stand of trees 70 years old;

• quaking aspen—46 to 48 cubic feet or 275 to 285 board feet (Scribner rule) of timber from a stand of trees 100 years old

Klizhin soil

Dominant overstory vegetation:

ponderosa pine (50%), Douglas-fir (20%), quaking aspen (20%), corkbark fir (10%)

Average site index:

ponderosa pine—84

Douglas-fir—75

quaking aspen—79

corkbark fir—84

Overstory production per acre (commercial):

- ponderosa pine—74 to 76 cubic feet or 445 to 455 board feet (Scribner rule) of timber from a stand of trees 40 years old;
- Douglas-fir—51 to 53 cubic feet or 310 to 320 board feet (Scribner rule) of timber from a stand of trees 70 years old;
- quaking aspen—46 to 48 cubic feet or 275 to 285 board feet (Scribner rule) of timber from a stand of trees 100 years old;
- corkbark fir—81 to 83 cubic feet or 485 to 495 board feet (Scribner rule) of timber from a stand of trees 100 years old

Major limitations:

Akhoni—hazard of soil blowing, hazard of water erosion, seedling mortality, windthrow hazard

Klizhin—hazard of water erosion, hazard of soil blowing, equipment limitations, plant competition

Suitable management practices and concerns:

- Manage the stands of trees for a combination of uses, including wood production.
- Snowpack and spring thaw limit the use of equipment and restrict access.
- Unsurfaced roads and skid trails are muddy when wet. They may be impassable during rainy periods.
- Roads may require ballast for use during logging operations.
- Adequately designed road drainage reduces the risk of water erosion.
- Restrict the use of wheeled and tracked equipment to periods when the soils are dry or frozen to prevent ruts, reduce compaction and subsequent water erosion, and prevent damage to the roots of trees.
- To help prevent soil compaction, use suitable methods of harvest and lay out skid trails well in advance.
- The careful use of wheeled and tracked equipment will help preserve the protective layers of duff on the soil surfaces.
- Maintaining the understory vegetation is essential in controlling erosion.
- Reduce the risk of water erosion and soil blowing by preventing excessive disturbance of the soils; seeding roads, cutbanks, and landings; and installing water bars and culverts.
- Limit the temperature of burning slash piles to prevent heat damage to duff layers and mineral soil surfaces.
- If healthy seed trees are left in a stand, reforestation will occur naturally in cutover areas.
- Improve stands by thinning before trees reach commercial size and by selective cutting of mature trees.

Akhoni soil

- Machine planting may be practical in nearly level areas.
- Reduce the problem of seedling mortality by leaving some of the larger trees to provide shade for seedling trees.
- Tree seedlings may become stunted and misshapen because of intensive grazing by sheep and goats during the summer.
- Areas on open summits that are exposed to strong, persistent winds are less productive than other areas.
- Because roots are restricted by bedrock, trees have a severe hazard of windthrow when the soil is excessively wet and winds are strong.
- To reduce the hazard of windthrow, avoid excessive cutting of trees, limit the width of maintained roads, and avoid making large openings in the canopy.

Klizhin soil

- The use of wheeled and tracked equipment in harvesting timber on this soil is moderately restricted in most places because of the presence of slopes over 15 percent.
- Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees.
- Reduce the problem of competition from unwanted plants by preventing the over-harvest of trees.

Livestock grazing**Akhoni soil***Dominant understory vegetation in potential plant community:*

earth sedge, Kentucky bluegrass, Gambel oak, mountain muhly, bottlebrush squirreltail, kinnikinnick, western brackenfern, pussytoes, mountain snowberry

Annual production of air-dry vegetation (pounds per acre):

Favorable years—800

Unfavorable years—300

Present understory plant community:

earth sedge, bottlebrush squirreltail, Kentucky bluegrass, pine dropseed, pussytoes, western yarrow, wild strawberry, kinnikinnick, Oregon grape

Klizhin soil*Dominant understory vegetation in potential plant community:*

Kentucky bluegrass, Gambel oak, western brackenfern, Ross sedge, earth sedge, nodding bromegrass, bottlebrush squirreltail, pussytoes,

pingue, mountain snowberry, Oregongrape, kinnikinnick

Annual production of air-dry vegetation (pounds per acre):

Favorable years—600

Unfavorable years—200

Present understory plant community:

Kentucky bluegrass, earth sedge, nodding bromegrass, mountain snowberry, Oregongrape, kinnikinnick

Major limitations:

Akhoni—hazard of soil blowing, hazard of water erosion, depth to bedrock

Klizhin—hazard of water erosion, hazard of soil blowing

Suitable management practices and concerns:

- Where the density of the canopy is less than about 60 percent, the understory produces plants suitable for grazing.
- Vary the season of grazing and the periods of rest during successive years.
- Control the time and amount of use by livestock.
- Reduce the risk of soil blowing and water erosion by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.
- To increase forage production, seed disturbed areas to suited grasses by broadcasting.
- Adequate site preparation is needed for successful seeding of understory plants.
- Seed late in the fall for best results.
- After seeding, defer grazing until the young grasses and tree seedlings are well established.

Akhoni soil

- The suitability for non-mechanized range seeding of grasses is fair because of soil factors.

Klizhin soil

- The suitability for non-mechanized range seeding of grasses is good.

Interpretive Groups

Land capability classification: **Akhoni**—nonirrigated—7s; **Klizhin**—nonirrigated—6e

Range site: **Akhoni**—not assigned (forestland); **Klizhin**—not assigned (forestland)

712—Sonsela-Washpass-Viewpoint complex, 20 to 70 percent slopes

Setting

Landform: Hills, buttes, and escarpments

Position on the landform: **Sonsela**—south-facing backslopes; **Washpass**—north-facing footslopes

and backslopes; **Viewpoint**—shoulders; **Rock outcrop**—cliffs and spires

Slope: **Sonsela**—35 to 70 percent; **Washpass**—25 to 70 percent; **Viewpoint**—20 to 35 percent

Shape of areas: Irregular

Size of areas: 100 to 1,000 acres

Elevation: 8,200 to 9,800 feet

Mean annual precipitation: 20 to 24 inches

Mean annual air temperature: 39 to 41 degrees F

Frost-free period: 60 to 90 days

Composition

Sonsela very cobbly fine sandy loam, extremely bouldery and similar soils: 40 percent

Washpass fine sandy loam, stony and similar soils: 25 percent

Viewpoint very gravelly loam, extremely stony and similar soils: 20 percent

Rock outcrop: 10 percent

Contrasting inclusions: 5 percent

Contrasting Inclusions

- The moderately fine textured Todacheene soil on footslopes ranging from 15 to 20 percent
- The somewhat poorly drained Owlspring soil on toeslopes

Characteristics of the Sonsela Soil

Typical profile:

- Soil surface is covered by 1 inch of oak leaves, pine needles, twigs, and cones
- 0 to 4 inches—dark brown very cobbly fine sandy loam
- 4 to 9 inches—brown gravelly fine sandy loam
- 9 to 26 inches—reddish brown very gravelly fine sandy loam and very gravelly sandy clay loam
- 26 to 48 inches—reddish brown very cobbly sandy clay loam
- 48 to 70 inches—brown extremely cobbly fine sandy loam

Parent material: Colluvium derived from basalt and tuff-breccia

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Low to moderate

Surface runoff: Rapid

Hazard of water erosion: Severe

Hazard of soil blowing: Slight

Characteristics of the Washpass Soil

Typical profile:

- Soil surface is covered by two inches of aspen leaves, fir needles, twigs, and cones

- 0 to 12 inches—dark brown and brown fine sandy loam
- 12 to 36 inches—brown fine sandy loam and gravelly fine sandy loam
- 36 to 57 inches—brown very gravelly fine sandy loam
- 57 to 85 inches—brown very fine sandy loam and gravelly fine sandy loam

Parent material: Colluvium derived from basalt and tuff-breccia

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately rapid

Available water capacity: Moderate

Surface runoff: Medium

Hazard of water erosion: Very severe

Hazard of soil blowing: Slight

Characteristics of the Viewpoint Soil

Typical profile:

- Soil surface is covered by 1 inch of pine needles, twigs, and cones
- 0 to 3 inches—dark brown very gravelly loam
- 3 to 9 inches—dark brown gravelly loam
- 9 to 14 inches—reddish brown gravelly clay loam
- 14 inches—basalt bedrock

Parent material: Colluvium and residuum derived from basalt and tuff-breccia

Depth class: Shallow

Drainage class: Well drained

Permeability: Moderate

Available water capacity: Very low

Surface runoff: Rapid

Hazard of water erosion: Moderate

Hazard of soil blowing: Moderate

Characteristics of Rock outcrop

Rock outcrop consists of exposures of tuff-breccia and basalt bedrock occurring as steeply sloping to vertical cliffs and spires, ranging from 15 to 200 feet high. There is little or no vegetation, and surface runoff is very rapid.

Major Uses

Timber production
Livestock grazing

Timber production

Sonsela soil

Dominant overstory vegetation:

ponderosa pine (75%), Douglas-fir (25%)

Average site index:

ponderosa pine—75

Douglas-fir—71

Overstory production per acre (commercial):

• ponderosa pine—61 to 63 cubic feet or 365 to 375 board feet (Scribner rule) of timber from a stand of trees 50 years old

• Douglas-fir—47 to 48 cubic feet or 280 to 290 board feet (Scribner rule) of timber from a stand of trees 70 years old

Washpass soil

Dominant overstory vegetation:

quaking aspen (65%), Douglas-fir (30%), corkbark fir (5%)

Average site index:

quaking aspen—62

Douglas-fir—75

corkbark fir—75

Overstory production per acre (commercial):

• quaking aspen—33 to 35 cubic feet or 200 to 210 board feet (Scribner rule) of timber from a stand of trees 80 years old;

• Douglas-fir—51 to 53 cubic feet or 310 to 320 board feet (Scribner rule) of timber from a stand of trees 70 years old;

• corkbark fir—68 to 70 cubic feet or 410 to 420 board feet (Scribner rule) of timber from a stand of trees 110 years old

Viewpoint soil

Dominant overstory vegetation:

ponderosa pine (75%), Douglas-fir (25%)

Average site index:

ponderosa pine—80

Douglas-fir—71

Overstory production per acre (commercial):

• ponderosa pine—68 to 70 cubic feet or 410 to 420 board feet (Scribner rule) of timber from a stand of trees 40 years old;

• Douglas-fir—46 to 48 cubic feet or 280 to 290 board feet (Scribner rule) of timber from a stand of trees 70 years old

Major limitations:

Sonsela—hazard of water erosion, equipment limitations, seedling mortality

Washpass—hazard of water erosion, equipment limitations, seedling mortality, plant competition

Viewpoint—hazard of water erosion, hazard of soil blowing, equipment limitations, seedling mortality, windthrow hazard

Suitable management practices and concerns:

• Manage the stands of trees for a combination of uses, including wood production.

- Snowpack and spring thaw limit the use of equipment and restrict access.
- Unsurfaced roads and skid trails are muddy when wet. They may be impassable during rainy periods.
- Roads may require ballast for use during logging operations.
- Adequately designed road drainage reduces the risk of water erosion.
- Remove the waste material resulting from road construction on gentle to moderate slopes to prevent damage to downhill vegetation and reduce a potential source of stream sedimentation.
- Restrict the use of wheeled and tracked equipment to periods when the soils are dry or frozen to prevent ruts, reduce compaction and subsequent water erosion, and prevent damage to the roots of trees.
- To help prevent soil compaction, use suitable methods of harvest and lay out skid trails well in advance.
- The careful use of wheeled and tracked equipment will help preserve the protective layers of duff on the soil surfaces.
- Maintaining the understory vegetation is essential in controlling erosion.
- Reduce the risk of water erosion and soil blowing by preventing excessive disturbance of the soils; seeding roads, cutbanks, and landings; installing water bars and culverts; and seeding cuts and fills.
- Use water bars and plant covers on steep yarding paths, skid trails, and firebreaks to control rilling and gullyng.
- If healthy seed trees are left in a stand, reforestation will occur naturally in cutover areas.
- Improve stands by thinning before trees reach commercial size and by selective cutting of mature trees.

Sonsela and Washpass soils

- Road construction should be avoided on slopes greater than 60 percent.
- The use of wheeled and tracked equipment in harvesting timber on these soils is severely restricted in most places because of the presence of slopes over 35 percent and large surface stones.
- Boulders and rock outcrops cause breakage of timber and hinder yarding.
- Droughtiness of the surface layers increases seedling mortality; especially on south- and southwest facing slopes.
- Reduce the problem of seedling mortality by leaving some of the larger trees to provide shade for seedling trees.
- Plant competition delays natural regeneration but does not prevent the eventual development of a fully stocked, normal stand of trees.

- Reduce the problem of competition from unwanted plants by preventing the over-harvest of trees.

Viewpoint soil

- The use of wheeled and tracked equipment in harvesting timber on this soil is moderately restricted in most places because of the presence of slopes over 15 percent and large surface stones.
- Areas on shoulders that are exposed to strong, persistent winds are less productive than other areas.
- Because roots are restricted by bedrock, trees have a severe hazard of windthrow when the soil is excessively wet and winds are strong.
- To reduce the hazard of windthrow, avoid excessive cutting of trees, limit the width of maintained roads, and avoid making large openings in the canopy.

Livestock grazing

Sonsela soil

Dominant understory vegetation in potential plant community:

muttongrass, earth sedge, Gambel oak, bottlebrush squirreltail, Kentucky bluegrass, nodding brome grass, Arizona fescue, mountain snowberry, Oregon grape

Annual production of air-dry vegetation (pounds per acre):

Favorable years—700

Unfavorable years—300

Present understory plant community:

Gambel oak, muttongrass, earth sedge, bottlebrush squirreltail, Arizona fescue, mountain snowberry, Oregon grape

Washpass soil

Dominant understory vegetation in potential plant community:

Kentucky bluegrass, mountain snowberry, earth sedge, nodding brome grass, Arizona fescue, silvery lupine, Oregon grape, Fendler meadowrue, wild strawberry

Annual production of air-dry vegetation (pounds per acre):

Favorable years—400

Unfavorable years—200

Present understory plant community:

Kentucky bluegrass, earth sedge, nodding brome grass, mountain snowberry, Oregon grape, wild strawberry

Viewpoint soil

Dominant understory vegetation in potential plant community:

earth sedge, muttongrass, bottlebrush squirreltail, Arizona fescue, prairie junegrass, mountain

muhly, pingue, Oregongrape, Gambel oak,
mountain snowberry

*Annual production of air-dry vegetation (pounds per
acre):*

Favorable years—600

Unfavorable years—200

Present understory plant community:

muttongrass, earth sedge, bottlebrush squirreltail,
prairie junegrass, Arizona fescue, Gambel oak,
mountain snowberry

Major limitations:

Sonsela—hazard of water erosion, steep slopes,
surface rock fragments

Washpass—hazard of water erosion, steep slopes,
lingering snowpack

Viewpoint—hazard of water erosion, hazard of soil
blowing, depth to bedrock, surface rock
fragments

Suitable management practices and concerns:

- Where the density of the canopy is less than about 40 percent, the understory produces plants suitable for grazing.
- Uniform distribution of grazing is difficult because of the slope or the lack of permanent water developments, or both.
- Livestock prefer to graze the easily accessible areas before they graze the steep slopes.

- Reduce the risk of water erosion and soil blowing by preventing overgrazing, maintaining adequate plant cover, and allowing plant litter to accumulate on the surface.

- If trees and shrubs are managed to create open areas, a good stand of plants suitable for use as forage can be produced.

- The suitability for non-mechanized range seeding of grasses is fair because of soil factors.

- To increase forage production, seed disturbed areas to suited grasses by broadcasting.

- Adequate site preparation is needed for successful seeding of understory plants.

- Seed late in the fall for best results.

- After seeding, defer grazing until the young grasses and tree seedlings are well established.

Interpretive Groups

Land capability classification: **Sonsela**—

nonirrigated—7e; **Washpass**—nonirrigated—7e;

Viewpoint—nonirrigated—7s

Range site: **Sonsela**—not assigned (forestland);

Washpass—not assigned (forestland);

Viewpoint—not assigned (forestland)

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, vegetation, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties. The potentials and limitations of each soil and miscellaneous land type are presented in the tables of this publication. The information in these tables was generated using the approved national standards of soil interpretation rating guides (USDA-NRCS, National Soil Survey Handbook).

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

By Richard D. Hansen, district conservationist, and Carl E. Pachek, conservation agronomist, Natural Resources Conservation Service.

General management needed for crops and pasture is suggested in this section. The estimated yields of the main crops and pasture plants are listed for each soil, the system of land capability classification used by the Natural Resources Conservation Service is explained, and prime farmland is described.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under the heading "Detailed Soil Map Units." Specific information can be obtained from the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

The agricultural land in the Shiprock Area falls into three major categories:

- 1) small, scattered irrigated plots,
- 2) older irrigation projects, and
- 3) organized irrigation projects.

The first group consists of about 5,000 acres in small plots being farmed without an organized irrigation system. Most of these areas are located in the foothills of the Chuska, Lukachukai, and Carrizo Mountains, or in areas that receive additional run-on moisture. Crops are limited to corn, grass, and alfalfa. Much of this land lies fallow until a good year for planting occurs.

The second group consists of about 10,000 acres in older irrigation projects along intermittent streams (USDA, 1986). Some examples are: Grey Mesa, Newcomb, and Two Grey Hills on Captain Tom Wash; Little Water, Sanostee, and Tocito on Sanostee Wash; Teec Nos Pos Wash; Immanuel Mission on Toh Chin Lini Canyon; Sweetwater on Walker Creek; and Rock Point on the Chinle Wash. These lands are in map units 5, 8, and 9, described in the section "General soil map units." Most of these areas are on rarely flooded low stream terraces, and are characterized by highly stratified, saline or sodic soils such as the

Jeddito soil in map unit 165 and the Uzaneva soil in map unit 524. However, the most limiting feature is the lack of dependable water for irrigation which severely limits the types of crops grown and the chance of a successful crop. It also limits the effectiveness of managing water. When water is available beyond what the soil can hold, irrigation may continue and perched water tables, salt concentrations, and seepage problems are aggravated. Most irrigation delivery systems are badly deteriorated with inadequate water storage systems.

The third and most important group consists of about 20,000 acres along the San Juan River, which are within the Fruitland, Hogback, and Cudei irrigation projects. Agricultural lands in these projects have a full season irrigation water supply diverted from the San Juan River, good delivery systems, and fertile, alluvial soils. These lands are in map unit 1, described in the section "General soil map units."

A lack of agricultural credit, poor predictability of canal operation policies, and current land use policy has nearly precluded commercial agriculture in the survey area. As a result, farming is usually financed with personal resources, and harvested crops of fruit, vegetables, and alfalfa hay are either consumed by the extended family or are marketed at the roadside.

The main crops grown in the survey area are alfalfa, corn, and pasture. Other crops are melons, squash, and fruit orchards. Most corn is grown to produce pollen for ceremonial purposes, or for unique colored corn grain for food, recreation, or ceremony.

The major objectives in cropland management are to improve systems and to manage soil, water, air, plants, and animals. Good management results in proper irrigation, maintenance of good soil tilth and fertility, and control of water erosion and soil blowing. On some soils, reduction of excess salinity or sodicity and adequate drainage are also needed. Increased crop quality and quantity, encouraging traditional use of plants, maintaining wildlife habitat on cropland, and improving esthetics are additional goals.

Irrigation—Irrigation water can be applied in such a way that good crop growth is obtained without wasting water or causing soil erosion. A dependable water supply and facilities to control the flow of water are necessary to irrigate with high efficiency. To irrigate properly, soil moisture should be checked regularly so that when about one half of water available to plants has been used, the next irrigation can be applied. When this is done, deep percolation of soil water containing soluble chemicals is held to a

minimum. Water is thus conserved, and plant nutrients are held in the root zone and do not become contaminants in surface or ground waters.

Important factors in using and managing water involve knowledge of the water-holding capacity of the soil, the depth to which plant roots penetrate, soil tilth, and the ease with which water moves into and through the soil. A soil probe, auger, or a shovel can be used to determine the moisture content of the root zone. Drought-tolerant plants grow slowly if moisture is inadequate. The soil profile should be checked after irrigation to determine if the water reached the desired depth and was applied uniformly. If not, adjustments in timing and amount of water applied may be made.

If water is applied too rapidly on soils with slow water intake rates such as Mesa clay loam, it runs off the field. If water is applied too slowly on soils with rapid water intake rates such as Razito loamy sand, it penetrates below the root zone and is not available for plant use. The grade and length of run used in the irrigation system should be designed according to the soil characteristics, the water supply, and the desired crops. Gated pipelines and concrete ditch linings are used to help control and conserve water.

Furrow and border are the two primary irrigation methods used in the survey area. The border method which consists of surface flooding between low dikes on level land, is most widely used for alfalfa, pasture, and small grains. The furrow method, which consists of running water into deeper, large furrows between the rows, is used for row crops. Corrugation and sprinkler irrigation are also suitable methods, but are not widely used.

Fertilization—Nitrogen and phosphorus are the main nutrients needed, in addition to natural sources, for sustained production of high-quality crops. Alfalfa responds to additional phosphorus, and other crops respond to added nitrogen. On sandy soil or soils that regularly receive applications of nitrogen and phosphorus, potassium may also be needed.

All of the soils in the irrigated portions of the survey area are low in organic matter. Using animal manure, growing green manure crops or cover crops, and returning crop residue to the soil are all beneficial practices. Management to supply nitrogen just before crops or organisms need it is important. Large applications in the fall of the year or at planting time are often lost through deep percolation that occurs as a result of over-irrigation or precipitation. Nitrogen should be added following the incorporation of large amounts of organic residue to allow micro-organisms to decompose the material more rapidly

and to maintain yields. Supplemental nitrogen is generally not needed with animal manures. Animal manures should not be applied in large amounts to soil surfaces frozen during the winter months.

Tillage—Excessive tillage or tilling when the soil is wet compacts the soil, which restricts root development and the movement of air and water in the root zone. If equipment is used when the soil is wet, a compaction layer or “plowpan” commonly develops. Tillage should be performed only when essential to grow a crop and only when the soil is dry. Chiseling or subsoiling when the soil is dry and growing deep-rooted crops such as alfalfa are practices that help to break up a compacted layer or zone.

Drainage—Over-irrigation and seepage from irrigation canals and faulty drainage canals have contributed to the artificially high water tables of some of the cropped soils in the area. These soils, such as the Mesa soils in map units 290 and 295, are on nearly level treads of high stream terraces, and are difficult to drain once they become wet. Salinity and sodicity can increase on poorly drained soils to a level that is detrimental to plant growth. Proper irrigation of higher lying areas and lining of irrigation canals will reduce the soil drainage problem. Surface or subsurface drains can be installed to improve drainage and thus decrease salinity and sodicity.

Other soils such as Green River, Werjo, and Werlog, have wet substrata and are naturally strongly saline-sodic. These soils are on high flood plains above the San Juan River; which is a typical environment for soluble salts to increase in loamy or silty soils as a result of capillary rise above the water table.

Soil Erosion—Soil blowing is a serious problem on many soils in the Shiprock Area. On irrigated lands it can be controlled by leaving an adequate amount of residue from previous crops on the surface until the crop being grown provides ground cover. Planting trees and other plants for windbreaks is also an effective practice.

Poorly designed irrigation systems may contribute to excessive erosion on sloping soils. Gated pipeline can assist in controlling furrow erosion. Land smoothing or leveling is desirable on some soils to reduce the slope to non-erosive grades and reduce runoff.

Pasture Management—Pasture is a practical and economically feasible land use for most irrigated soils in the survey area. The main objective of pasture management is to maintain vigorous stands of palatable, well suited plants for livestock feed, to improve the soil, and to control water erosion and soil

blowing. Proper grazing practices, adequate fertilization, irrigation water management, clipping, and weed control help to meet these objectives.

Proper grazing practices include delaying grazing until plants have made a good start in the spring, avoiding grazing too closely, rotation grazing, and periodic rest from grazing. A good fertility management program involves adding fertilizer when needed. Clipping helps to distribute grazing and stimulates growth. Where stands are thin, controlling weeds by mowing or spraying results in more available moisture and plant nutrients for desirable species.

Yields per Acre

The average yields per acre that can be expected of the principal irrigated crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good-quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation

Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops (USDA, 1961). Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit. Only class and subclass are used in this survey. This information is displayed in table 5 for the irrigated crops only. Nonirrigated class and subclass is given in the individual detailed map unit descriptions.

Capability classes, the broadest groups, are designated by numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter,

e, w, s, or c, to the class numeral, for example, IIe. The letter e shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; w shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); s shows that the soil is limited mainly because it is shallow, droughty, strongly saline, strongly sodic, or stony; and c, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by w, s, or c because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forest land, or other land, but it is not urban or built-up land or water areas. The soil qualities, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. It is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

There are no prime farmland soils in the Shiprock Area. Soil erodibility hazards, salinity, sodicity, and/or depth to seasonal high water table exceed the acceptable levels for prime farmlands.

Rangeland

By Harmon S. Hodgkinson, Range Conservationist, Natural Resources Conservation Service.

Approximately 80 percent of the land in the survey area is rangeland. Much of the rangeland is at low elevations and is utilized year-round by sheep, goats, cattle, and horses.

Most of the herd sizes are small and family-owned and operated. The families' traditional grazing areas are in close proximity to their homes. Some grazing areas are fenced for cattle and are used primarily for cow-calf operations. Sheep and goats are taken out daily to graze by a herder and dogs. Various routes taken and repeated in an orderly manner always bring the animals back to the corral at the end of the day for protection from predators.

The desert, foothills, and mountains are the three major zones used for livestock grazing. The people live in the desert and foothill zones and graze their animals there in the fall, winter, and spring. Summer grazing takes place in the Chuska, Lukachukai, and Carrizo Mountains.

Numerous livestock watering facilities, mainly windmills and troughs, have been developed in the grazing areas. In the mountains, spring developments are common. Those people using fenced areas have developed range management plans and have implemented range practices such as proper grazing use, range seeding, planned grazing systems, and brush management.

The land is Indian trust land and is administered by the United States Department of the Interior's Bureau of Indian Affairs.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Table 6 shows, for each soil that supports rangeland vegetation suitable for grazing, the range site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the average percentage of each species. An explanation of the column headings in table 6 follows.

A *range site* is a distinctive kind of rangeland that

produces a characteristic natural plant community that differs from natural plant communities on other range sites in kind, amount, and proportion of range plants. The relationship between soils and vegetation was ascertained during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important.

Total production is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight is the total annual yield per acre of air-dry vegetation. Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods.

Characteristic vegetation—the grasses, forbs, and shrubs that make up most of the potential natural plant community on each soil is listed by common name. Under *composition*, the expected percentage of the total annual production is given for each species making up the characteristic vegetation. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season.

Range management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range condition. Range condition is determined by comparing the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the potential community, the better the range condition. Range condition is an ecological rating only.

The main goal of rangeland management should be to use the native forage plants at an intensity which will maintain or improve the quantity and quality of

the vegetation for soil protection and forage production. This goal can be achieved by proper grazing. Most native herbaceous forage plants remain vigorous and produce good leaf growth if at least 50 percent of the annual production by weight remains at the end of the grazing season. To meet this objective, implementation of a grazing system is necessary. The animals should be moved from the forage resource when the desired use level has been reached.

Range improvement is recommended in areas where the native plant community has been degraded and is now producing poor-quality plants for forage or seed production. Controlling undesirable brush plants and seeding adapted species is especially applicable in areas receiving 10 or more inches of precipitation per year.

Some range sites are better suited to seeding than others. The Loamy Upland and Sandy Loam Upland sites in poor condition have the best potential for reseeding. The soils occurring in these range sites have the fewest limitations for seeding. A firm, weed-free seedbed must be prepared to allow for maximum moisture at the shallow depth of seed placement. A suitable drill having depth-band regulators or other methods to firm the seedbed are very important for seedling establishment. Late fall is the best time to seed. The seed will be dormant until it germinates in the spring, taking advantage of winter and spring moisture. The seeded area must be protected from grazing until the plants are well established.

There are areas in the Loamy Upland and Sandy Loam Upland range sites where brush species, such as Wyoming big sagebrush, broom snakeweed, and rubber rabbitbrush have increased beyond the percentage desired in the potential native plant community. Methods of control may be applied to the brush to reduce the percentage to a tolerable level. This will provide space for more nutritious plants to grow and aid in protecting the soil from erosion.

Rangeland that is best suited to brush management has desirable understory species that will respond to the soil moisture and plant nutrients that the brush formerly used. These areas are usually in fair range condition. If no understory species exist, seeding will be necessary after brush management.

Physical methods used to control brush include prescribed burning, rotobating, disking, and plowing. Biological and chemical controls are also used. Some brush species are killed by certain methods, while others flourish under the same treatment. The right method must be matched to the particular species for best results.

Long-term improvement programs and good range

management results in a balanced native plant community that stabilizes the soil resource.

Woodland Management and Productivity

By Harmon S. Hodgkinson, range conservationist, Natural Resources Conservation Service.

Approximately 20 percent of the land in the survey area is woodland. Of this, about 5 percent has commercial value and 15 percent is noncommercial woodland. Steep slopes, rocky terrain, and shallow soils typify the landscapes of the woodland and montane forest areas. However, the woodland soils if properly managed, produce good quality wood products. The woodland plant communities occur in distinct zones which are delineated by natural factors and processes such as precipitation, temperature, and old wildfire patterns.

The dominant trees in the 12- to 16-inch precipitation zone are twoneedle pinyon and Utah juniper with an understory of shrubs and grasses. Typical understory species are muttongrass, Wyoming big sagebrush, true mountainmahogany, Utah snowberry, and datil (banana) yucca. This is the typical vegetation of the noncommercial woodland, and it occurs as a band between the lower rangeland and higher forested areas of the survey. This zone occurs between about 6,500 and 8,000 feet elevation. It is dominantly in map units 11, 12, and a portion of 13, described in the section "General soil map units."

The commercial woodland areas begin in the 16- to 20-inch precipitation zone, where ponderosa pine is the predominant forest tree. Some Douglas-fir and twoneedle pinyon are also present. The understory vegetation is mainly earth sedge, silvery lupine, western brackenfern, Gambel oak, and other grasses and shrubs. This zone occurs between about 7,500 and 9,000 feet in elevation. It is below the main rim of the Chuska and Lukachukai Mountains, and is dominantly in general soil map unit 14.

Ponderosa pine, Douglas-fir, corkbark (subalpine) fir, and quaking aspen are the typical forest trees in the 20- to 24-inch precipitation zone. Scattered stands of blue spruce and Engelmann spruce are also present in cool, moist locations, primarily along streams. Common understory species are Kentucky bluegrass, mountain brome, Oregongrape, mountain snowberry, and Gambel oak. This zone occurs between about 8,400 and 9,800 feet in elevation. It is in general soil map unit 15 on the summit areas of the Chuska and Lukachukai Mountains.

The steep backslopes of the Carrizo Mountains contain areas of woodland dominated either by

twoneedle pinyon, or by Douglas-fir on steep, north aspects. Scattered groves of Gambel oak and ponderosa pine are also present on the summit areas of this mountain range. These forests and wooded areas are not of commercial value for the Navajo Nation, but are utilized by local people for various uses. This portion of the survey area occupies most of general soil map unit 13.

All major woodlands or forests of the Navajo Nation are regulated by the Navajo Forestry Department. A permit system is used to remove any woodland or forest product. The Navajo Forest Products Industries, located in Navajo, New Mexico, is the main processor of sawtimber, primarily ponderosa pine. Other forest products like posts, rails, shade house boughs, Christmas trees, transplants, and dead and downed wood, are available to the Navajo people within the guidelines of Forestry Department regulations. Some products are available to non-Navajo people living on the reservation.

The land is Indian trust land and is administered by the United States Department of the Interior's Bureau of Indian Affairs.

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for an indicator tree species. The number indicates the volume, in cubic meters per hectare per year, which the indicator species can produce in a pure stand under natural conditions. The number 1 indicates low potential productivity; 2 or 3, moderate; 4 or 5, moderately high; 6 to 8, high; 9 to 11, very high; and 12 to 39, extremely high. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *R* indicates steep slopes; *X*, stoniness or rockiness; *W*, excess water in or on the soil; *T*, toxic substances in the soil; *D*, restricted rooting depth; *C*, clay in the upper part of the soil; *S*, sandy texture; *F*, a high content of rock fragments in the soil; *L*, low strength; and *N*, snowpack. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: *R*, *X*, *W*, *T*, *D*, *C*, *S*, *F*, *L*, and *N* (USDA-NRCS, National forestry manual.).

In table 7, *slight*, *moderate*, and *severe* indicate the degree of the major soil limitations to be considered in management.

Erosion hazard is the probability that damage will occur as a result of site preparation and cutting where the soil is exposed along roads, skid trails, and fire lanes and in log-handling areas. Forests that have been burned or overgrazed are also subject to erosion. Ratings of the erosion hazard are based on the percent of the slope. A rating of slight indicates that no particular prevention measures are needed under ordinary conditions. A rating of moderate indicates that erosion-control measures are needed in certain silvicultural activities. A rating of severe indicates that special precautions are needed to control erosion in most silvicultural activities.

Equipment limitation reflects the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. The chief characteristics and conditions considered in the ratings are slope, stones on the surface, rock outcrops, soil wetness, and texture of the surface layer. A rating of slight indicates that under normal conditions the kind of equipment and season of use are not significantly restricted by soil factors. Soil wetness can restrict equipment use, but the wet period does not exceed 1 month. A rating of moderate indicates that equipment use is moderately restricted because of one or more soil factors. If the soil is wet, the wetness restricts equipment use for a period of 1 to 3 months. A rating of severe indicates that equipment use is severely restricted either as to the kind of equipment that can be used or the season of use. If the soil is wet, the wetness restricts equipment use for more than 3 months.

Seedling mortality refers to the death of naturally occurring or planted tree seedlings, as influenced by the kinds of soil, soil wetness, or topographic conditions. The factors used in rating the soils for seedling mortality are texture of the surface layer, depth to a seasonal high water table and the length of the period when the water table is high, rock fragments in the surface layer, effective rooting depth, and slope aspect. A rating of slight indicates that seedling mortality is not likely to be a problem under normal conditions. Expected mortality is less than 25 percent. A rating of moderate indicates that some problems from seedling mortality can be expected. Extra precautions are advisable. Expected mortality is 25 to 50 percent. A rating of severe indicates that seedling mortality is a serious problem. Extra precautions are important. Replanting may be necessary. Expected mortality is more than 50 percent.

Windthrow hazard is the likelihood that trees will be uprooted by the wind because the soil is not deep

enough for adequate root anchorage. The main restrictions that affect rooting are a seasonal high water table and the depth to bedrock, a fragipan, or other limiting layers. A rating of slight indicates that under normal conditions no trees are blown down by the wind. Strong winds may damage trees, but they do not uproot them. A rating of moderate indicates that some trees can be blown down during periods when the soil is wet and winds are moderate or strong. A rating of severe indicates that many trees can be blown down during these periods.

Plant competition ratings indicate the degree to which undesirable species are expected to invade and grow when openings are made in the tree canopy. The main factors that affect plant competition are depth to the water table and the available water capacity. A rating of slight indicates that competition from undesirable plants is not likely to prevent natural regeneration or suppress the more desirable species. Planted seedlings can become established without undue competition. A rating of moderate indicates that competition may delay the establishment of desirable species. Competition may hamper stand development, but it will not prevent the eventual development of fully stocked stands. A rating of severe indicates that competition can be expected to prevent regeneration unless precautionary measures are applied.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index* and as a *volume* number. For most tree species the site index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. For the pinyon-juniper type, site index is correlated to basal area. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The *volume of wood fiber*, a number, is the yield likely to be produced by the most important trees. This number, expressed as cubic feet per acre per year, indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand.

The first species listed under *common trees* for a soil is the indicator species for that soil. It generally is the most common species on the soil and is the one that determines the ordination class.

Suggested *trees to manage* are those that are suitable for commercial wood production.

The Navajo Nation's Department of Forestry has an extensive inventory and management plan for the

commercial woodlands of the Shiprock Area. A main management goal is to selectively harvest mature trees on a sustained-yield basis and thin young stands to maximize wood growth. Wildlife habitat, livestock grazing, surface and ground water quality, natural beauty, and recreation are also considered in the plan. Final removal cuts, partial removal cuts, intermediate cuts, pre-commercial thinning, pole and post cutting, and reforestation are some of the planned activities.

Major management concerns on these woodlands are steep slopes and soils that have large rock fragments on the surface. Steep, rocky slopes restrict equipment use and indicate to the forest manager a need to choose the proper equipment. Harvesting methods and woodland improvement practices on these slopes are more costly than on gentle slopes. Accelerated soil erosion can occur on all soils, but is a greater hazard on soils of steep slopes. Special precautions are needed to control erosion and protect water quality where soil is exposed along roads, skid trails, and loading areas. When developing and implementing woodland plans, special attention should be given to forested soils on slopes of more than 35 percent.

Some practices that will aid in the use and management of both types of woodlands are seeding of disturbed areas, installation of cross drains on roads, and proper grazing of understory species. In addition, in commercial woodlands disposal of slash in a way that prevents soil erosion by protecting surface horizons and duff layers, and proper site preparation for reforestation after tree harvest are important concerns.

Woodland Understory Vegetation

Understory vegetation consists of grasses, forbs, shrubs, and other plants. If well managed, some woodland can produce enough understory vegetation to support grazing of livestock or wildlife, or both, without damage to the trees.

The quantity and quality of understory vegetation vary with the kind of soil, the age and kind of trees in the canopy, the density of the canopy, and the depth and condition of the forest litter or duff layer. The density of the canopy determines the amount of light that understory plants receive.

Table 6 lists the common names of the characteristic vegetation on each soil. The table shows the kind of understory plants expected under a canopy density that is most nearly typical of woodland in which the production of wood crops is highest.

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind, snow, and blowing dirt. They help in conserving energy and beautifying an area. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks and grass barriers are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks and grass barriers protect cropland and crops from wind, help to conserve moisture, and provide food and cover for wildlife.

Environmental and farmstead plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, healthy planting stock of suitably adapted species should be planted properly on a well prepared site that is maintained in good condition.

Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from the local office of the Natural Resources Conservation Service or of the Cooperative Extension Service or from a commercial nursery.

Each tree or shrub species has certain climatic and physiographic limits. Within these parameters, a tree may be well or poorly suited for a windbreak because of soil characteristics. Windbreak suitability groups were developed to assure satisfactory individual species performance under specified conditions of soil, climate, and physiography. Species are grouped according to expected height growth at 20 years given good management.

Windbreak suitability groups are a guide for selecting species best suited for different kinds of soils and for predicting height growth and effectiveness. They may be used to select plants for windbreaks, recreation and wildlife plantings, ornamental or environmental plantings, afforestation, reforestation, and critical area plantings.

All soil series, phases, or soil map units may be placed in 10 groups of similar soils. Groups 1, 2, 4, 6, and 9 may be further divided into subgroups. A short description of each group is given, including limitations or potential problems to be encountered in the establishment and growth of windbreak plants. The irrigated soils in the Shiprock Area are also listed following each group description.

Windbreak Suitability Groups

Group 1

Soils in this group are very deep, and well drained to somewhat poorly drained. They receive additional moisture from favorable landscape positions such that flooding, runoff from adjacent land, or a seasonal high water table in spring provides beneficial moisture. High soil reaction (pH) will have an effect on the selection of windbreak species on some soils in this group. Competition from weeds is the principal concern in establishing and managing trees and shrubs. The subgroup 1K is recognized for calcareous soils.

The slightly saline phases of the Green River and Werjo soils in map units 153 and 157 (respectively), and the Mesa soil in map units 290 and 295 are in this subgroup.

Group 2

Soils in this group are deep or very deep, poorly drained or very poorly drained, and are excessively wet or ponded during the spring or overflow periods. Wetness limits the selection of species suitable for planting on these soils and may reduce the growth rate. Wetness, high pH, and drainage will have an effect on the selection of plants for soils in this group. Competition from grass and weeds is the principal concern in establishing and managing tree and shrub species. Spring planting may be delayed because of wet conditions, and soil blowing is a concern on sandy and organic soils in this group. Two subgroups exist for soils in group 2. Subgroup 2K is for calcareous soils and subgroup 2H is for muck or organic soils.

Group 3

Soils in this group are deep or very deep, well drained, and loamy textured. They occur on uplands and have moderate or moderately slow permeability. Competition from grass and weeds is the principal concern in establishing and managing trees and shrubs on these soils. The hazard of water erosion is a concern on the gently sloping to moderately steep areas.

The Jeddito soil in map unit 190 and the Chinlini soil in map unit 409 are in this group.

Group 4

Soils in this group are moderately deep to very deep, and have loamy surface textures with clayey subsoils. They occur on uplands and have slow or very slow permeability. High clay content and water availability have an effect on the selection of tree and shrub species for these soils. Competition from grass and weeds is the principal concern in the

establishment and management of trees and shrubs. The hazard of water erosion is a concern on the gently sloping to moderately steep areas. Subgroup 4C is for soils which are clayey throughout the entire soil profile.

Group 5

Soils in this group are deep or very deep, with loamy or sandy textures. This group includes soils that normally have adequate soil moisture. Competition from grass and weeds, and abrasion from soil blowing are the principal concerns in establishing and managing trees and shrubs on these soils.

The Fruitland soil in map unit 270, the Suwanee soil in map unit 175, and the Tocito soil in map unit 200 are in this group.

Group 6

Soils in this group are moderately deep to very deep, and have mostly loamy textures. They are either moderately deep to bedrock or a cemented pan, or they have sand or gravel layers at moderate depth (20 to 40 inches). They have low or moderate available water capacity which makes droughtiness a concern with tree and shrub selection. Competition from grass and weeds is the principal concern in the establishing and managing trees and shrubs. The hazard of water erosion is a concern on gently sloping to moderately steep areas. Supplemental watering may be needed for establishment of windbreak species. Subgroup 6D is for moderately deep soils over bedrock or a cemented pan and subgroup 6G is for soils with sand and/or gravel at moderate depth.

The Blackston soil in map unit 102 is in subgroup 6G.

Group 7

Soils in this group are deep or very deep, excessively drained to moderately well drained, sandy in texture, have low or very low available water capacity, and are normally dry. Drought conditions and abrasion from soil blowing are the principal concerns in establishing and managing trees and shrubs on these soils. Specialized site preparation (due to hummocky surface conditions) and planting methods (leaving vegetation undisturbed between rows) may be needed to establish trees and shrubs. Supplemental water is essential for successful establishment of a windbreak.

The Razito soil in map unit 275 is in this group.

Group 8

Soils in this group are highly calcareous at or near the soil surface. They do not receive beneficial moisture from flooding, runoff from adjacent lands, or a seasonal high water table. The high calcium

carbonate content in the upper soil horizons and competition from grass and weeds are the principal concerns in establishing and managing trees and shrubs on these soils. The hazard of water erosion is a concern on gently sloping to moderately steep areas.

Group 9

Soils in this group are significantly affected by salinity and/or sodicity. The concentrations of soluble salts and exchangeable sodium may severely affect the establishment, vigor, and growth of trees and shrubs on these soils. Three subgroups are recognized in group 9. Subgroup 9C is for clayey, saline and/or sodic soils with no seasonal high water table; subgroup 9L is for loamy, saline and/or sodic soils with no seasonal high water table; and subgroup 9W is for saline and/or sodic soils which have a seasonal high water table.

The Notal soil in map units 170 and 177, and the Uzaneva soil in map unit 524 are in subgroup 9C. The Jeddito soil in map unit 165 and the Gotho soil in map unit 512 are in subgroup 9L. Subgroup 9W includes the Green River saline soil in map unit 153, the Werjo saline soil in map unit 157, and the Werlog soil in map unit 163.

Group 10

Soils in this group have one or more characteristics such as soil depth, texture, drainage, erosion, available water capacity, slope, or soluble salts, which are severe limitations for the planting, survival, or growth of trees and shrubs. For example, all soils on slopes greater than about 15 percent, very wet soils, and shallow soils fall into group 10. These soils are usually not recommended for windbreaks or environmental plantings.

Recreation

Shiprock Area has many places of scenic, geologic, and historic interest. These areas are used for camping, hiking, hunting, fishing, sightseeing, picnicking, pinyon nut gathering, nature study, and photography.

Tribal lands officially set aside for these activities include the Four Corners Monument for sightseeing and curio shopping; the Owl Spring and Buffalo Pass areas for picnicking; and Aspen, Berland, Toadlena, and Todacheene Lakes for trout fishing. The Ship Rock pinnacle and other volcanic necks of the area, which are adjacent to maintained roads, are popular sightseeing destinations. Prominent rock arches, such as the one at Cove, Arizona, draw people interested in natural formations. The red rock canyons west of Sanostee contain beautiful scenery,

lush riparian vegetation, and the longest rock span in the state of New Mexico in Snake Arch. Fragile Anasazi ruins and cliff dwellings attract individuals curious about ancient civilizations.

Use of these areas for recreation may have increased in recent years, although accurate records of visitor use do not exist for most places. The portions of the survey area with the highest amount of use for recreation are in map units 9, 12, 13, 14, and 15, described in the section "General soil map units." Some of the soils in these areas are not the most suited to the developed recreation uses presented in table 8. Lands on the Navajo Nation not specifically set aside for recreation are considered private. Technical rock climbing on the Ship Rock and other sacred sites is prohibited. For more detailed information on recreational activities, contact the Navajo Nation's Division of Natural Resources located in Window Rock, Arizona.

The soils of the survey area are rated in table 8 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 8, the degree of soil limitation is expressed as slight, moderate, or severe. Slight means that soil properties are generally favorable and that limitations are minor and easily overcome. Moderate means that limitations can be overcome or alleviated by planning, design, or special maintenance. Severe means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or a combination of these measures.

The information in table 8 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 11 and interpretations for dwellings without basements and for local roads and streets in table 10.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas,

stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils are moderately deep to very deep, have gentle slopes, are not wet, and are not subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, does not have fragile cryptogam crusts, and is not dusty when dry. Steep slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are moderately deep to very deep, firm when wet, are not dusty when dry, do not have fragile surface crusts, are not subject to frequent flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are moderately deep to very deep, are nearly level, are not wet, and are not subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, does not have fragile cryptogam crusts, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, do not have fragile surface crusts, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are deep or very deep, firm when wet, are not dusty when dry, and are not subject to flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The best soils are also low in salt, sodium, and lime and are not droughty. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

David W. Seery, biologist, Natural Resources Conservation Service, helped prepare this section.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The

kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 9, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

There are six general areas containing wildlife habitat in the Shiprock Area:

- 1.) Plateaus, mesas, and terraces
- 2.) Mountains
- 3.) River and stream valleys
- 4.) Wetlands
- 5.) Breaks
- 6.) Rock outcrops

Plateaus, mesas, and terraces contain soils which have grasslands on the gently undulating to steep slopes. Grasses and shrubs grow on soils ranging from very shallow to very deep.

Fan terraces and stream terraces form old land surfaces near valleys and mountains. These upland sites are home to pronghorn antelope, badger, prairie dogs, and hawks. Antelope could be reintroduced if given protection until established. Badgers and other burrowing animals make extensive use of areas of coarse and moderately coarse textured soils.

Mountains occur in the middle portion of the survey area along the state line between New Mexico and Arizona.

The Chuska and Lukachukai Mountains are actually a high, dissected plateau containing some of the most important wildlife habitat in the area. Woodlands of ponderosa pine, Douglas-fir, pinyon, juniper, and Gambel oak provide habitat for turkey, mule deer, black bear, band-tailed pigeons, owls, hawks, and song birds.

Open grassy valleys are home to prairie dogs and possibly the endangered black-footed ferret. The long tailed weasel also occurs in these areas. Local wetlands are important for many birds, waterfowl, and local mammals. Steep slopes and variable topography also play important roles in wildlife habitat.

The Carrizo Mountains in Arizona are historic habitat for grizzly bears and desert bighorn sheep. They survived there longer than almost anywhere else on the Navajo Reservation (University of Arizona Press, 1982).

River and stream valleys occur along such streams as the San Juan, Chaco, and Mancos River, the Chinle Wash, and Walker Creek. They contain riparian vegetation and water for wildlife use. These areas are used by all local wildlife for some part of their needs.

Song birds nest in cottonwood and willow trees in large numbers. Cavity nesting birds find many nest sites in holes within large cottonwood trees. Quail use the thick vegetation for cover and seed sources. The abundant prey species attract many predators such as coyote, skunk, hawks, and bobcat. Mule deer may spend their whole lives in these river bottoms.

The potential for competition between livestock and wildlife is high. The plant communities in these riparian areas must be maintained in good condition to provide wildlife habitat, flood protection, water quality, and soil erosion control.

Wetlands are areas containing hydrophytic vegetation, hydric soils, and wetland hydrology. Marshes are wetlands dominated by grasses and grass-like plants, and they occur in several portions of the survey area. Some are in old, abandoned channels in the San Juan River valley and are produced by ground water. Others are in rock basins on summit areas of the Chuska Mountains which fill with water from melting snow and rain. Other small marshes are human-induced and formed by leaking irrigation ditches.

All of these wetlands are used extensively by a large variety of wildlife species. Predators and prey species alike gather at these oases in an otherwise dry landscape.

Wetlands provide natural protection from flooding,

enhance water quality, furnish habitat for wildlife, and conserve water. Wetlands need protection from excessive grazing, drainage projects, and poorly planned urban development.

Breaks are the steep, broken lands on the escarpments of mesas and plateaus. Breaks are very eroded and dissected, with many small ridges and gullies. Vegetation grows on the soils occurring in breaks, but not in large amounts. Although annual production of air-dry vegetation is generally low, plant diversity is high. This botanic diversity, along with the physical cover provided by the terrain, provides an attractive habitat for wildlife. Mule deer hide in breaks and feed on browse plants such as true mountainmahogany. Coyote and red fox find cover in the intricate, rocky landscapes. Trees growing on breaks of higher elevations provide nest sites and hunting perches for raptors such as the red-tailed hawk.

Rock outcrops furnish wildlife habitat when they occur as cliffs below rims of plateaus, mesas, and canyons. Although little or no vegetation grows on rock outcrops, they are still important to many species. Eagles, hawks, turkey vultures, owls, and swallows nest on cliffs and ledges. Migratory bats seasonally roost in cracks and caves. Foxes, bobcats, bears, and cougars have dens in alcoves and caves.

More specific information on characteristic wildlife species, and management of the soils in the Shiprock Area for wildlife habitat, is in the map units described in the section "General soil map units."

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, lovegrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally

established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are ponderosa pine, Douglas fir, twoneedle pinyon and juniper.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are mountainmahogany, antelope bitterbrush, Utah snowberry, and Wyoming big sagebrush.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, saltgrass, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, deer, and bear.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include antelope, deer, sage grouse, meadowlark, and lark bunting.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works (USDA-NRCS National Engineering Handbook).

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-

swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, roadfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 10 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered slight if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; moderate if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and severe if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high

water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings are single-family houses of three stories or less. For *dwellings without basements*, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. For *dwellings with basements*, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of about 7 feet. The ratings for dwellings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility. Compressibility is inferred from the Unified classification. The properties that affect the ease and amount of excavation include depth to a water table, ponding, flooding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

Small commercial buildings are structures that are less than three stories high and do not have basements. The foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. The ratings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility (which is inferred from the Unified classification). The properties that affect the ease and amount of excavation include flooding, depth to a water table, ponding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or soil material stabilized by lime or cement; and a surface of flexible material (asphalt), rigid material (concrete), or gravel with a binder. The ratings are based on the soil properties that affect the ease of excavation and

grading and the traffic-supporting capacity. The properties that affect the ease of excavation and grading are depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, depth to a water table, ponding, flooding, the amount of large stones, and slope. The properties that affect the traffic-supporting capacity are soil strength (as inferred from the AASHTO group index number), subsidence, linear extensibility (shrink-swell potential), the potential for frost action, depth to a water table, and ponding.

Unsurfaced roads are those that normally lack asphalt, concrete, or other surfacing and are expected to carry truck or automobile traffic when free of snow. The roads consist of the underlying soil material, or subgrade, and a road surface of compacted soil material and gravel. They are normally constructed from the soil at hand and may be graded to shed water. The ratings are based on factors that affect grading, ease of excavation, and traffic supporting capacity. The soil properties that affect grading and ease of excavation are depth to bedrock or to a cemented pan, depth to high water table, slope, flooding, and stones. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, potential frost action, and depth to a high water table affect the traffic supporting capacity.

Fencing is the construction and maintenance of barriers that facilitate the management and control of animals. The barriers are constructed of metal, or treated or untreated wooden posts buried at least two feet into the soil with at least three, but more commonly five wires, suspended between the posts. The ratings are based on the soil properties that influence ease of setting posts in the soil to the desired depth, maintaining the desired wire tension, and keeping replacement and maintenance cost to a minimum over the projected life of the fence. Excavations for wooden post holes are commonly made by power auger, while metal posts are driven into the soil or rock outcrops. Depth to bedrock or a cemented pan, and large and small stones influence the ease of excavation of post holes and of driving posts. Flooding and depth to high water table may restrict the season in which fencing can be constructed. Flooding can also increase maintenance and replacement costs. Depth to high water table and ponding can influence maintenance cost and require deeper post settings to offset the low strength of saturated soil. Shrink-swell potential, slope, sandy textures, and potential frost action also influence construction and maintenance cost. Soil salinity will influence construction and maintenance cost due to

corrosivity to uncoated steel. The presence of steep to vertical rock outcrops is a limitation that is difficult to overcome in fence construction.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. Irrigation is not considered in the ratings. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding, depth to a water table, ponding, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer.

Sanitary Facilities

Table 11 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered slight if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; moderate if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and severe if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 11 also shows the suitability of the soils for use as daily cover for landfill. A rating of good indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; fair indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and poor indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of

the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 11 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a *trench landfill*, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an *area landfill*, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy

vehicular traffic. Both types involve a risk of ground-water pollution. This risk is low in the dry soils of arid and semiarid regions. Ease of excavation and revegetation should be considered.

The ratings in table 11 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to wind erosion.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as the final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 12 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good*, *fair*, or *poor* as a source of roadfill and topsoil. They are rated as a probable or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, many stones, or 10 to 15 percent gypsum. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, slopes of more than 25 percent, or more than 15 percent gypsum. They are wet and have a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 12, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a *probable* source has a layer of

clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Detached fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel because their resistance to slaking or rupture is too low. Sand does not slake to finer (silt or clay) particles and gravel has strong resistance to rupture.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts and sodium, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay; soils that have only 20 to 40 inches of suitable material; soils that have an appreciable amount of gravel, cobbles, stones, boulders, soluble salts or sodium; or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey; have less than 20 inches of suitable material; have a large amount of gravel, cobbles, stones, boulders, soluble salts or sodium; have slopes of more than 15 percent; or have a seasonal high water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 13 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees;

and aquifer-fed excavated ponds. The limitations are considered slight if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; moderate if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and severe if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, and terraces and diversions.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, soluble salts, sodium, or gypsum. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the

salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by problematic substances in the root zone like salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to

supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of soluble salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 14 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area (Portland Cement Association, 1973). Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated in inches. The range in depth and information on other properties of each layer are given for each soil series under the heading "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture (USDA, 1993). These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less

than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (American Society for Testing and Materials, 1993) and the system adopted by the American Association of State Highway and Transportation Officials (1986).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420,

and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical Properties

Table 15 shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Particle size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle sizes are expressed as classes with specific effective diameter class limits. The broad classes are sand, silt, and clay, ranging from the larger to the smaller.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In table 15, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at $1/3$ - or $1/10$ -bar (33kPa or 10kPa) moisture

tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability (K_{sat}) refers to the ability of a soil to transmit water or air. The term "permeability," as used in soil surveys, indicates saturated hydraulic conductivity (K_{sat}). The estimates in the table indicate the rate of water movement, in inches per hour, when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at $1/3$ - or $1/10$ -bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. Volume change is influenced by the amount and type of clay minerals in the soil.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 15, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained by returning crop residue to the soil. Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Erosion factors are shown in table 15 as the K factor (Kw and Kf) and the T factor. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of several factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and permeability. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor Kw indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is the soil loss tolerance. It is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting the quality of the soil as a medium for plant growth over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to soil blowing in cultivated or bare disturbed areas. There is a close correlation between soil blowing and the size and durability of surface cloddiness, rock fragments, organic matter, and the calcareous reaction. The soil properties that are most important with respect to soil blowing are soil texture, organic matter content, calcium carbonate reaction (effervescence), rock fragment content, and aggregate stability. Soils are placed into wind erodibility groups on the basis of the properties of the surface layer. The term "calcareous" means the fine-earth fraction of the surface layer has a strongly or violently effervescent reaction to cold, dilute hydrochloric acid. The soils assigned to group 1 are the most susceptible to soil blowing, and those

assigned to group 8 are the least susceptible. The groups are as follows:

1. Coarse sands, sands, fine sands, and very fine sands.
2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, ash material, and sapric soil material.
3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams.
- 4L. Calcareous loams, silt loams, clay loams, and silty clay loams. Calcareous sandy clay loams are also assigned to this group in this survey area.
4. Clays, silty clays, noncalcareous clay loams, and noncalcareous silty clay loams that are more than 35 percent clay.
5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material.
6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay.
7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material.
8. Soils that are not subject to soil blowing because of greater than 60 percent rock fragments in or on the surface or because of surface wetness.

Wind erodibility index (I), used in the Wind Erosion Equation (WEQ), is assigned using the wind erodibility groups. The wind erodibility index values are assigned because of the difficulty in directly measuring them in the field. Wind erodibility index is used in calculations to determine prime farmland soils and highly erodible soil map units (USDA, 1997). In this survey it is used to assign hazard of soil blowing to components of detailed soil map units. The index values are assigned to soil surface layers as follows:

- 310. Very fine sand surfaces in wind erodibility group 1
- 250. Fine sand surfaces in wind erodibility group 1
- 220. Sand surfaces in wind erodibility group 1
- 180. Coarse sand or sand surfaces in wind erodibility group 1
- 160. Coarse sand surfaces in wind erodibility group 1
- 134. Surfaces in wind erodibility group 2
- 86. Surfaces in wind erodibility group 3
- 86. Surfaces in wind erodibility group 4L
- 86. Surfaces in wind erodibility group 4
- 56. Surfaces in wind erodibility group 5
- 48. Surfaces in wind erodibility group 6
- 38. Surfaces in wind erodibility group 7
- 0. Surfaces in wind erodibility group 8

The following rules are used to determine wind

erodibility index values for surface layers that have significant amounts of rock fragments: If the percentage of rock fragments by volume is between 15 and 35 percent, the index value is reduced by one wind erodibility group with a lower "I" value (e.g. a gravelly loamy sand is reduced from 134 to 86). If the percentage of rock fragments by volume is between 35 and 60, the index value is reduced by two wind erodibility groups with a lower "I" value (e.g. a very gravelly fine sandy loam is reduced from 86 to 48). If the percentage of rock fragments by volume is greater than 60, an "I" value of 0 is assigned for wind erodibility group 8.

Chemical Properties

Table 16 shows estimates of some chemical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Cation-exchange capacity is the amount of exchangeable cations that a soil can adsorb at pH 7.0. Cation-exchange capacity is a measure of the ability of a soil layer to retain cations, some of which are plant nutrients. Soils that have a low cation-exchange capacity hold fewer cations and may require more frequent applications of fertilizer than soils that have a high cation-exchange capacity. Soils that have high cation-exchange capacity have the potential to retain nutrient cations and some pesticide compounds in upper layers, which reduces the risk of pollution of ground water. Cation-exchange capacity is expressed in milliequivalents per 100 grams (meq/100g) of soil.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Calcium carbonate equivalent is the quantity of carbonate in the soil expressed as calcium carbonate and as a weight percentage of the less than 2 millimeter fraction.

Availability of plant nutrients is influenced by the amount of carbonates in the soil. This is a result of the effect that carbonates have on soil pH and of the

direct effect that carbonates have on nutrient availability. Nitrogen fertilizers should be incorporated into calcareous soils to prevent nitrite accumulation or ammonium-nitrogen volatilization. The availability of phosphorous and molybdenum to plant roots is reduced by the high levels of calcium and magnesium which are associated with carbonates. In addition, iron, boron, zinc, and manganese deficiencies are common in some plants growing in soils that have a high calcium carbonate equivalent. In dry climates, soil surfaces high in calcium carbonate are more subject to blowing during periods of prolonged, strong winds. This effect may occur in soils that have calcium carbonate equivalent of more than 5 percent.

Gypsum is the percentage, by weight, of hydrated calcium sulfates in the fraction of the soil material that is less than 20 millimeters in diameter. Gypsum is partially soluble in water and can be dissolved and removed by water. Soils high in gypsum such as those with more than 10 percent gypsum, may collapse if the gypsum is removed by percolating water. Gypsum is corrosive to concrete. Corrosion of concrete is most likely to occur in soils that are more than about 1 percent gypsum, when periodic wetting and drying occurs.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of non-irrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Sodium adsorption ratio is a measure of the amount of sodium relative to calcium and magnesium in the water extract from saturated soil paste. It is the ratio of the sodium concentration divided by the square root of one-half of the calcium plus magnesium concentration. Concentrations are in milliequivalents per liter. Soils that have values for sodium adsorption ratio of 13 or more may have increased dispersion of organic matter and clay particles, reduced permeability and aeration, and a general degradation of soil structure. These deleterious effects may be evident in some soils when values for sodium adsorption ratio are as low as 4 or 5 and the soils are irrigated with high-quality, low-salt water (Shainberg, et al., 1981). Such soils do

not have enough calcium carbonate or soluble salts to maintain clay particles in a non-dispersed (flocculated) state.

Water Features

Table 17 gives estimates of various water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms. The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clay soils that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

The *months* in the table indicate the portion of the year in which the feature is most likely to be a concern.

Water table refers to a saturated zone in the soil. Table 17 indicates, by month, depth to the top (*upper limit*) and base (*lower limit*) of the saturated zone in most years. Estimates of the upper and lower limits are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors indicating reduced iron and/or wetness mottles (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

Ponding is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation. Table 17 indicates *surface water depth* and the *duration* and *frequency* of ponding. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days.

Frequency is expressed as none, rare, occasional, and frequent. *None* means that ponding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of ponding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of ponding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of ponding is more than 50 percent in any year).

Flooding is the temporary covering of the soil surface by flowing water, is caused by overflowing streams, by runoff from adjacent slopes, or by a combination of both sources. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in marshes is considered ponding rather than flooding.

Duration and *frequency* are estimated. Duration is expressed as *extremely brief* if 0.1 hour to 4 hours, *very brief* if 4 hours to 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, rare, occasional, frequent, and very frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is 1 to 5 percent in any year or nearly 1 to 5 times in 100 years); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year, or 5 to 50 times in 100 years); *frequent* that it is likely to occur often under normal weather conditions (the chance of flooding is more than 50 percent in any year, or more than 50 times in 100 years).

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

Soil Features

Table 18 gives estimates of various soil features. The estimates are used in land use planning that involves engineering considerations.

A *restrictive layer* is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers. The table indicates the hardness and thickness of the restrictive layer, both of which significantly affect the ease of excavation. *Depth to top* is the vertical distance from the soil surface to the upper boundary of the restrictive layer.

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence generally results from either desiccation and shrinkage or oxidation of organic material, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. Subsidence is not a problem in this survey area, so entries are not given.

Potential for frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the

potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel or concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel or concrete in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, electrical resistivity near field capacity, and electrical conductivity of the saturation extract (salinity).

For concrete, the risk of corrosion also is expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (USDA, 1981 and USDA, 1993). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 19 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Eleven soil orders are recognized. Five of the orders occur in the Shiprock Area. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in sol. An example is Aridisol. Alfisols, Aridisols, Entisols, Inceptisols, and Mollisols occur in this survey area.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Argid (Arg, meaning presence of an argillic horizon, plus id, from Aridisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; type of saturation; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplargids (Hap, meaning minimal horizonation, plus argid, the suborder of the Aridisols that have an argillic horizon).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the

great group. The adjective Typic identifies the subgroup that typifies the great group. An example is Typic Haplargids.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle size, mineral content, soil temperature regime, soil depth, and reaction. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, mesic Typic Haplargids.

SERIES. The series consists of soils within a family that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. An example of a soil series with the taxonomic classification listed above is the Redlands series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" (USDA, 1993). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (USDA, 1975) and in "Keys to Soil Taxonomy" (USDA, 1993). Unless otherwise indicated, matrix colors in the descriptions are for dry soil. Moist colors are described for soils which have drainage classes ranging from poorly to very poorly drained. Following the pedon description is the range of important characteristics of the soils in the series. Locations of typical pedons are described in notation of both the U.S. Public Land Survey and the Geographic Coordinate System.

For the Public Land Survey, township and section lines were projected onto USGS 7.5 minute

topographic quadrangle maps, where such lines were lacking. These projections were plotted using plat diagrams (group 812) for New Mexico, and protraction diagrams for Arizona. The diagrams were obtained from the Bureau of Land Management-USDI cadastral survey office in Window Rock, Arizona. The Public Land Survey for the San Juan County, New Mexico portion is based on the New Mexico principal meridian and base line of 1855. The Apache County, Arizona portion is based on the Gila and Salt River meridian and base line of 1865, and also on the Navajo Special meridian and base line of 1869. The portion of the survey area covered by the Navajo Special meridian is on the Arizona side of the Tsaile Butte 7.5 minute topographic quadrangle map (Map sheet 49).

For the Geographic Coordinate System (latitude and longitude), all point locations are here referenced to the National Geodetic horizontal control network established by the North American datum of 1927. The map units of each soil series are described in the section "Detailed Soil Map Units."

Akhoni Series

Classification: Loamy, mixed Lithic Haploborolls

Depth class: Shallow

Drainage class: Well drained

Permeability: Moderately rapid

Landform: Summits of high plateaus, mesas, and structural benches

Parent material: Alluvium and residuum derived from sandstone

Slope range: 1 to 15 percent

Elevation: 8,500 to 9,200 feet

Mean annual precipitation: 20 to 24 inches

Mean annual air temperature: 39 to 42 degrees F.

Frost-free period: 70 to 100 days

Typical Pedon

Akhoni fine sandy loam, in an area of map unit 700—Akhoni-Retaw complex, 0 to 15 percent slopes; San Juan County, New Mexico; about 8 miles south-southwest of Toadlena; 800 feet south and 2,100 feet east of the northwest corner of sec. 23, T.22N., R.20W.; latitude 36 degrees 7 minutes 52 seconds N and longitude 108 degrees 56 minutes 42 seconds W.

Soil surface is covered by 1 inch of pine needles, cones, and twigs; abrupt smooth boundary.

A—0 to 3 inches; dark brown (7.5YR 4/2) fine sandy loam, dark brown (7.5YR 3/2) moist; moderate thick platy structure parting to moderate fine granular; soft, very friable, slightly sticky and

nonplastic; common very fine and few medium roots; common very fine and few fine irregularly shaped pores; 5 percent channers; slightly acid; clear smooth boundary.

BA—3 to 8 inches; dark brown (7.5YR 4/2) fine sandy loam, dark brown (7.5YR 3/2) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common very fine and few coarse roots; common very fine and few fine tubular pores; 5 percent channers; slightly acid; clear smooth boundary.

Bw—8 to 17 inches; brown (7.5YR 5/3) fine sandy loam, dark brown (7.5YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common very fine and few coarse roots; common very fine and few fine tubular pores; 10 percent channers; slightly acid; clear wavy boundary.

2R—17 inches; sandstone bedrock.

Range in Characteristics

Soil depth: 10 to 20 inches

Silicate clay content, control section weighted average: 8 to 18 percent

Reaction: ranges from slightly acid to neutral

A horizon:

Value: 3 or 4 dry, 2 or 3 moist

Chroma: 1 or 2

BA horizon:

Value: 4 or 5 dry

Chroma: 2 or 3

Texture: fine sandy loam or sandy loam

Rock fragments: total range is 0 to 10 percent;

0 to 5 percent channers,

0 to 5 percent flagstones

Bw horizon:

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 2 through 4

Texture: fine sandy loam or sandy loam

Rock fragments: total range is 5 to 10 percent;

5 to 10 percent channers,

0 to 5 percent flagstones

Aneth Series

Classification: Sandy, mixed, mesic Typic Torriorthents

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Moderately rapid

Landform: Eolian-mantled fan terraces and toeslopes

Parent material: Eolian material and alluvium derived from sandstone, siltstone, and shale

Slope range: 1 to 8 percent

Elevation: 4,700 to 5,400 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 52 to 56 degrees F.

Frost-free period: 140 to 170 days

Typical Pedon

Aneth loamy fine sand, in an area of map unit 505—Recapture-Shorthair-Aneth complex, 1 to 8 percent slopes; Apache County, Arizona; about 3.5 miles north of Teec Nos Pos; 950 feet east and 950 feet north of the southwest corner of sec. 14, T.41N., R.30E.; latitude 36 degrees 57 minutes 18 seconds N and longitude 109 degrees 5 minutes 54 seconds W.

A—0 to 8 inches; reddish brown (5YR 5/4) loamy fine sand, reddish brown (5YR 4/4) moist; weak thick platy structure parting to weak fine granular; soft, very friable, nonsticky and nonplastic; few fine and common very fine roots; few very fine vesicular pores; slightly effervescent; mildly alkaline; abrupt smooth boundary.

Bw—8 to 17 inches; light reddish brown (5YR 6/4) loamy fine sand, reddish brown (5YR 4/4) moist; weak coarse subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few fine and common very fine roots; few very fine irregularly shaped pores; strongly effervescent; moderately alkaline; clear wavy boundary.

BC—17 to 28 inches; light reddish brown (5YR 6/3) loamy fine sand, reddish brown (5YR 5/4) moist; weak coarse subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few fine and common very fine roots; few very fine irregularly shaped pores; 5 percent pebbles; strongly effervescent, secondary calcium carbonates segregated as very few, fine and medium, irregularly shaped accumulations on faces of peds; moderately alkaline; abrupt wavy boundary.

2Btkb—28 to 37 inches; light reddish brown (5YR 6/4) fine sandy loam, reddish brown (5YR 4/4) moist; weak medium prismatic structure parting to moderate coarse subangular blocky; slightly hard, friable, slightly sticky and nonplastic; few fine and very fine roots; common very fine tubular pores; few thin clay films on faces of peds and bridging sand grains; 5 percent pebbles; strongly effervescent, secondary calcium carbonates segregated as few fine and medium irregularly shaped accumulations on faces of

peds and on rock fragments; moderately alkaline; clear smooth boundary.

2Bkb—37 to 54 inches; light reddish brown (5YR 6/3) loamy fine sand, reddish brown (5YR 5/4) moist; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few fine and very fine roots; common very fine tubular pores; 5 percent pebbles; strongly effervescent, secondary calcium carbonates segregated as few fine irregularly shaped accumulations on faces of peds and on rock fragments; moderately alkaline; abrupt smooth boundary.

3Btkb—54 to 65 inches; light reddish brown (5YR 6/3) fine sandy loam, reddish brown (5YR 4/3) moist; weak medium prismatic structure parting to moderate coarse subangular blocky; hard, friable, slightly sticky and nonplastic; few fine and very fine roots; few very fine tubular pores; few thin clay films on faces of peds and lining pores; 5 percent pebbles; strongly effervescent, secondary calcium carbonates segregated as few fine and medium irregularly shaped accumulations on faces of peds and as filaments; moderately alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 8 to 12 percent

Rock fragment content, control section weighted average: 0 to 5 percent pebbles

Depth to buried soil: 25 to 39 inches

Reaction: ranges from mildly alkaline in the surface to strongly alkaline in the substratum

A horizon:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

Bw or BC horizons:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 through 6

Btkb horizon:

Value: 5 through 7 dry, 4 or 5 moist

Chroma: 3 through 6

Texture: fine sandy loam, very fine sandy loam, or loamy fine sand

Arabrab Series

Classification: Loamy, mixed, mesic Lithic Haplustalfs

Depth class: Shallow

Drainage class: Well drained

Permeability: Moderate

Landform: Dipslopes of cuestras and summits of mesas

Parent material: Alluvium and residuum derived from sandstone and quartz diorite

Slope range: 5 to 60 percent

Elevation: 6,200 to 8,500 feet

Mean annual precipitation: 12 to 16 inches

Mean annual air temperature: 48 to 50 degrees F.

Frost-free period: 120 to 140 days

Typical Pedon

Arabrab extremely cobbly very fine sandy loam, extremely stony, in an area of map unit 416—Arabrab-Rock outcrop complex, 15 to 60 percent slopes; Apache County, Arizona; about 9 miles southwest of Teec Nos Pos; 100 feet east and 300 feet south of the northwest corner of sec. 34, T.40N., R.29E.; latitude 36 degrees 50 minutes 16 seconds N and longitude 109 degrees 13 minutes 43 seconds W.

A—0 to 2 inches; reddish brown (5YR 5/4) extremely cobbly very fine sandy loam, reddish brown (5YR 4/3) moist; weak medium platy structure parting to moderate medium granular; soft, very friable, slightly sticky and nonplastic; common fine and very fine roots; few very fine tubular and irregularly shaped pores; 20 percent cobbles, 20 percent pebbles, 15 percent channers, 10 percent flagstones, 5 percent stones, and 2 percent boulders; neutral; clear smooth boundary.

Bt—2 to 11 inches; yellowish red (5YR 5/6) gravelly sandy clay loam, reddish brown (5YR 4/4) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and few coarse, medium, and very fine roots; few fine and common very fine tubular pores; very few moderately thick clay films on faces of peds, and common thin clay films on faces of peds and lining pores; 15 percent pebbles, 5 percent cobbles, and 5 percent channers; neutral; clear wavy boundary.

Btk—11 to 15 inches; light reddish brown (5YR 6/4) gravelly sandy clay loam, reddish brown (5YR 5/4) moist; moderate coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine and few coarse to fine roots; common fine and few very fine tubular pores; few moderately thick clay films on faces of peds, and few thin clay films on faces of peds and lining pores; 15 percent pebbles and 5 percent channers; strongly effervescent, secondary calcium carbonates segregated as

few fine irregularly shaped accumulations on faces of peds and on rock fragments; moderately alkaline; abrupt wavy boundary.

2R—15 inches; sandstone bedrock.

Range in Characteristics

Soil depth: 10 to 20 inches

Silicate clay content, control section weighted average: 20 to 27 percent

Reaction: ranges from neutral in the surface to moderately alkaline in the lower subsoil

A horizon:

Hue: 5YR or 7.5YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 or 4

Texture: extremely cobbly very fine sandy loam or very flaggy very fine sandy loam

Rock fragments: total range is 35 to 80 percent; 10 to 20 percent pebbles, 10 to 15 percent channers, 5 to 20 percent cobbles, 10 to 20 percent flagstones, 0 to 5 percent stones

Bt and Btk horizons:

Hue: 5YR or 7.5YR

Value: 4 through 6 dry, 3 through 5 moist

Chroma: 4 through 6

Texture: gravelly sandy clay loam, sandy clay loam, or flaggy sandy clay loam

Rock fragments: total range is 10 to 35 percent; 10 to 15 percent pebbles and channers, 0 to 15 percent flagstones and cobbles, 0 to 5 percent stones

Calcium carbonate equivalent: 0 to 15 percent

Arches Series

Classification: Mixed, mesic Lithic Torripsamments

Depth class: Shallow

Drainage class: Well drained

Permeability: Rapid

Landform: Summits of structural benches

Parent material: Eolian material and residuum derived from sandstone

Slope range: 4 to 25 percent

Elevation: 5,600 to 6,500 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F.

Frost-free period: 130 to 150 days

Typical Pedon

Arches loamy fine sand, in an area of map unit 306—Arches-Kitsili-Mido complex, 1 to 25 percent slopes;

San Juan County, New Mexico; about 19.5 miles southwest of Shiprock; 1,350 feet north and 1,800 feet west of the southeast corner of sec. 28, T.28N., R.20W.; latitude 36 degrees 37 minutes 45 seconds N and longitude 108 degrees 58 minutes 35 seconds W.

A—0 to 3 inches; yellowish red (5YR 5/5) loamy fine sand, yellowish red (5YR 4/6) moist; weak medium platy structure parting to single grain; soft, very friable, nonsticky and nonplastic; common fine and very fine roots; slightly effervescent; moderately alkaline; clear wavy boundary.

C1—3 to 7 inches; yellowish red (5YR 5/6) loamy fine sand, yellowish red (5YR 4/6) moist; single grain; loose, nonsticky and nonplastic; few medium and common very fine roots; strongly effervescent; moderately alkaline; gradual wavy boundary.

C2—7 to 14 inches; red (2.5YR 5/6) loamy fine sand, red (2.5YR 4/6) moist; single grain; loose, nonsticky and nonplastic; few medium and very fine roots; strongly effervescent; moderately alkaline; abrupt smooth boundary.

2C3—14 to 18 inches; light reddish brown (2.5YR 6/4) sand, reddish brown (2.5YR 4/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few coarse and very fine roots; 15 percent soft sandstone fragments; slightly effervescent; moderately alkaline; abrupt smooth boundary.

2R—18 inches; sandstone bedrock.

Range in Characteristics

Soil depth: 10 to 20 inches

Silicate clay content, control section weighted average: 2 to 8 percent

Reaction: ranges from mildly alkaline to moderately alkaline

A horizon:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 through 6

C and 2C horizons:

Hue: 2.5YR or 5YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 through 6

Texture: loamy fine sand, loamy sand, sand, or fine sand

Other features: 0 to 30 percent soft sandstone fragments

Atlatl Series

Classification: Coarse-loamy, carbonatic, mesic

Calciorthidic Ustochrepts

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Moderate

Landform: Knolls and rims of plateaus and mesas, and dipslopes of cuevas

Parent material: Eolian material, alluvium, and residuum derived from sandstone and siltstone

Slope range: 1 to 15 percent

Elevation: 6,300 to 7,900 feet

Mean annual precipitation: 12 to 16 inches

Mean annual air temperature: 48 to 50 degrees F.

Frost-free period: 130 to 150 days

Typical Pedon

Atlatl gravelly fine sandy loam, in an area of map unit 400—Wetherill-Atlatl association, 1 to 15 percent slopes; San Juan County, New Mexico; about 16 miles northeast of Shiprock and 0.5 miles south of the Colorado-New Mexico state line; 1,500 feet south and 400 feet east of the northwest corner of sec. 17, T.32N., R.16W.; latitude 36 degrees 59 minutes 26 seconds N and longitude 108 degrees 33 minutes 17 seconds W.

A—0 to 2 inches; brown (7.5YR 5/4) gravelly fine sandy loam, brown (7.5YR 4/4) moist; moderate medium platy structure parting to moderate fine granular; soft, very friable, slightly sticky and nonplastic; few very fine roots; few very fine vesicular pores; soil surface has a patchy black cryptogam crust; 10 percent fine pebbles and 5 percent small channers; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk1—2 to 8 inches; light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; few coarse and medium, many fine, and common very fine roots; few very fine continuous tubular pores; 5 percent soft sandstone fragments; 5 percent fine pebbles and 5 percent small channers; violently effervescent, secondary calcium carbonates segregated in very few fine irregularly shaped accumulations on undersides of rock fragments; moderately alkaline; clear smooth boundary.

Bk2—8 to 17 inches; light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 4/4) moist; weak

medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common coarse and fine and few medium and very fine roots; few very fine continuous tubular pores; 25 percent soft sandstone fragments; 5 percent channers and 5 percent flagstones; violently effervescent, secondary calcium carbonates segregated in few fine irregularly shaped accumulations around rock fragments; moderately alkaline; clear wavy boundary.

2Bk3—17 to 23 inches; very pale brown (10YR 7/3) loam, light yellowish brown (10YR 6/4) moist; weak very thick platy structure; slightly hard, friable, slightly sticky and nonplastic; few coarse and very fine and common fine roots; few very fine discontinuous tubular pores; 5 percent soft sandstone fragments; 5 percent channers; violently effervescent, matrix is impregnated with secondary calcium carbonates; moderately alkaline; clear smooth boundary.

2Bk4—23 to 30 inches; white (10YR 8/1) loam, very pale brown (10YR 7/3) moist; weak thick platy structure; hard, firm, slightly sticky and nonplastic; few coarse to very fine roots; few very fine discontinuous tubular pores; 5 percent soft sandstone fragments; 5 percent channers; violently effervescent, matrix is impregnated and partially cemented in places with secondary calcium carbonates; moderately alkaline; abrupt smooth boundary.

2R—30 inches; sandstone bedrock.

Range in Characteristics

Soil depth: 20 to 40 inches

Silicate clay content, control section weighted average: 15 to 18 percent

Rock fragment content, control section weighted average: 5 to 15 percent

Depth to calcic horizon: 2 to 4 inches

A horizon:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 3 or 4 moist

Rock fragments: total range is 15 to 25 percent;

10 to 15 percent fine pebbles,

5 to 10 percent channers (less than 3 inches long),

Calcium carbonate equivalent: 10 to 15 percent

Bk horizons:

Hue: 7.5YR or 10YR

Value: 5 through 8 dry, 4 through 7 moist

Chroma: 2 through 4

Texture: fine sandy loam or loam

Rock fragments: total range is 0 to 15 percent;

0 to 5 percent pebbles,

0 to 5 percent channers (less than 3 inches long),

0 to 5 percent flagstones

Calcium carbonate equivalent: 15 to 70 percent

Other features: 0 to 35 percent soft sandstone fragments, and 0 to 30 percent soft calcareous siltstone fragments

2Bk or 2Bck horizons:

Value: 6 through 8 dry, 4 through 7 moist

Chroma: 2 through 4

Texture: fine sandy loam or loam

Rock fragments: total range is 0 to 15 percent;

0 to 10 percent channers (less than 3 inches long)

0 to 5 percent flagstones

Calcium carbonate equivalent: 40 to 90 percent

Other features: 5 to 25 percent soft sandstone fragments, and 0 to 40 percent soft calcareous siltstone fragments

Bangston Series

Classification: Sandy, mixed Typic Cryoborolls

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Rapid

Landform: North-facing backslopes of plateaus, mesas, and structural benches

Parent material: Alluvium and colluvium derived from sandstone

Slope range: 35 to 50 percent

Elevation: 8,500 to 9,200 feet

Mean annual precipitation: 20 to 24 inches

Mean annual air temperature: 39 to 41 degrees F.

Frost-free period: 60 to 90 days

Typical Pedon

Bangston loamy sand, in an area of map unit 708—Tunitcha-Bangston association, 35 to 60 percent slopes; San Juan County, New Mexico; about 10 miles northwest of Toadlena; 2,050 feet west and 2,125 feet north of the southeast corner of sec. 12, T.24N., R.21W.; latitude 36 degrees 19 minutes 38 seconds N and longitude 109 degrees 1 minute 53 seconds W.

Soil surface is covered by 1 inch of fir needles, cones, and twigs; abrupt smooth boundary.

A—0 to 7 inches; dark grayish brown (10YR 4/2) loamy sand, very dark brown (10YR 2/2) moist; moderate medium platy structure parting to moderate medium granular; soft, very friable, nonsticky and nonplastic; few coarse and many

very fine roots; common very fine irregularly shaped pores; neutral; clear smooth boundary.

BA—7 to 16 inches; dark grayish brown (10YR 4/2) loamy sand, very dark brown (10YR 2/2) moist; moderate medium subangular blocky structure; soft, friable, nonsticky and nonplastic; few coarse and common fine roots; common very fine tubular pores; 5 percent soft sandstone fragments; neutral; clear wavy boundary.

Bw—16 to 26 inches; brown (7.5YR 4/2) loamy sand, dark brown (7.5YR 3/2) moist; moderate coarse subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; few very fine and many fine roots; common very fine tubular pores; 5 percent soft sandstone fragments; neutral; clear wavy boundary.

2E—26 to 43 inches; brown (10YR 5/3) flaggy loamy sand, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; few very fine and common fine roots; few fine and common very fine tubular pores; common bleached sand grains (skeletons) on faces of peds; 15 percent flagstones, 10 percent pebbles, and 5 percent channers; neutral; clear wavy boundary.

2E and Bt—43 to 66 inches; light yellowish brown (7.5YR 6/4) very flaggy loamy sand; yellowish brown (7.5YR 5/4) moist; massive; soft, very friable, nonsticky and nonplastic; common fine and very fine roots; few fine and common very fine tubular pores; common bleached sand grains (skeletons) in the matrix (E part); very few thin clay films on rock fragments and clay bridging sand grains in few thin lamellae less than 1 cm thick (Bt part); 20 percent flagstones, 10 percent channers, and 10 percent pebbles; neutral.

Range in Characteristics

Silicate clay content, control section weighted average: 4 to 8 percent

Rock fragment content, control section weighted average: 0 to 30 percent

Depth to base of mollic epipedon: 24 to 40 inches

A horizon:

Value: 3 or 4 dry, 2 or 3 moist

BA horizon:

Value: 3 or 4 dry, 2 or 3 moist

Texture: loamy sand or loamy fine sand

Other features: 0 to 10 percent soft sandstone fragments

Bw horizon:

Hue: 7.5YR or 10YR

Value: 4 or 5 dry, 3 or 4 moist

Texture: loamy sand or loamy fine sand

Other features: 0 to 15 percent soft sandstone fragments

2E horizon:

Hue: 7.5YR or 10YR

Value: 4 through 6 dry, 3 or 4 moist

Chroma: 2 or 3

Texture: flaggy loamy sand, flaggy loamy fine sand, or loamy sand

Rock fragments: total range is 5 to 30 percent;

0 to 10 percent pebbles,

0 to 5 percent channers (less than 3 inches long),

5 to 15 percent flagstones

2E and Bt horizon:

Hue: 7.5YR or 10YR

Value: 4 through 6 dry, 3 through 5 moist

Chroma: 2 through 4

Texture: very flaggy loamy sand or very flaggy loamy fine sand

Rock fragments: total range is 35 to 60 percent;

5 to 10 percent pebbles,

0 to 5 percent cobbles,

10 to 15 percent channers,

20 to 30 percent flagstones

Other features: lamellae are less than 1 cm thick, or are less than 6 inches total within 80 inches.

Bebeever Series

Classification: Sandy, mixed, mesic Oxyaquic
Torrifluvents

Depth class: Very deep

Drainage class: Moderately well drained

Permeability: Moderately rapid

Landform: Inter-channel bars of low flood plains

Parent material: Alluvium derived from sandstone, granite, and quartzite

Slope range: 0 to 2 percent

Elevation: 4,600 to 5,000 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Bebeever loamy sand, in an area of map unit 142—Bebeever-Walrees complex, 0 to 2 percent slopes; San Juan County, New Mexico; about 3 miles east of Shiprock and north of the San Juan River; 2,300 feet south and 800 feet west of the northeast corner of

sec. 33, T.30N., R.17W.; latitude 36 degrees 46 minutes 18 seconds N and longitude 108 degrees 37 minutes 50 seconds W.

AC—0 to 4 inches; pale brown (10YR 6/3) loamy sand, brown (10YR 4/3) moist; weak medium platy structure parting to weak fine granular; soft, very friable, slightly sticky and nonplastic; few fine and very fine roots; few very fine vesicular pores; few thin lenses of fine sandy loam; slightly effervescent; moderately alkaline; clear wavy boundary.

C1—4 to 13 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 5/3) moist; few fine faint dark yellowish brown (10YR 4/4) redox concentrations; massive; soft, very friable, slightly sticky and nonplastic; few medium, common fine, and few very fine roots; few very fine discontinuous tubular pores; 5 percent pebbles; few thin lenses of fine sandy loam; slightly effervescent; moderately alkaline; abrupt wavy boundary.

C2—13 to 28 inches; pale brown (10YR 6/3) gravelly coarse sand, brown (10YR 4/3) moist; few fine faint dark yellowish brown (10YR 4/4) redox concentrations; single grain; loose, nonsticky and nonplastic; few fine and very fine roots; one thin stratum of fine sandy loam with common fine distinct dark yellowish brown (10YR 4/6) redox concentrations; 25 percent pebbles; very slightly effervescent; moderately alkaline; clear wavy boundary.

C3—28 to 36 inches; pale brown (10YR 6/3) very gravelly coarse sand, brown (10YR 4/3) moist; few fine faint dark yellowish brown (10YR 4/4) redox concentrations; single grain; loose, nonsticky and nonplastic; few medium and very fine roots; 40 percent pebbles and 10 percent cobbles; very slightly effervescent; mildly alkaline; abrupt wavy boundary.

C4—36 to 70 inches; light brownish gray (10YR 6/2) sand, dark grayish brown (10YR 4/2) moist; few fine faint dark yellowish brown (10YR 4/4) redox concentrations; single grain; loose, nonsticky and nonplastic; few fine roots; few strata of gravelly coarse sand; 5 percent pebbles; very slightly effervescent; mildly alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 2 to 10 percent

Rock fragment content, control section weighted average: 0 to 35 percent

Reaction: ranges from mildly alkaline to moderately alkaline

Salinity, mmhos/cm: 2 to 4

Sodicity, SAR: 0 to 5

Depth to seasonal high water table: 3.5 to 5.0 feet

AC horizon:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 through 4

Rock fragments: total range is 0 to 15 percent; 0 to 5 percent pebbles, 0 to 10 percent cobbles

C horizons:

Value: 5 or 6 dry, 4 or 5 moist

Texture: stratified very gravelly coarse sand to very fine sandy loam; most horizons are dominantly loamy fine sand, sand, coarse sand, gravelly sand, gravelly coarse sand and very gravelly coarse sand, with thin strata and lenses of fine sandy loam or very fine sandy loam

Rock fragments: total range is 0 to 55 percent; 0 to 45 percent pebbles, 0 to 10 percent cobbles

Calcium carbonate equivalent: 1 to 5 percent

Redoximorphic features: few to common, fine to medium, and faint to distinct, yellowish brown, dark yellowish brown, or strong brown redox concentrations; color expression is greater in the thin loamy strata; redox depletions are present in horizons below 40 inches in some pedons

Other features: some pedons have lamina or lenses of silt loam or silty clay loam

Beclabito Series

Classification: Fine-loamy, mixed, mesic Haplic Natrargids

Depth class: Deep

Drainage class: Well drained

Permeability: Moderately slow

Landform: Toeslopes between cuestas, and on footslopes and alluvial cones of escarpments

Parent material: Alluvium and residuum derived from sandstone and shale

Slope range: 1 to 45 percent

Elevation: 4,900 to 6,500 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F.

Frost-free period: 130 to 150 days

Typical Pedon

Beclabito fine sandy loam, in an area of map unit 304—Farview-Beclabito-Rock outcrop association, 1 to 10 percent slopes; San Juan County, New Mexico;

about 18 miles west of Shiprock and 3 miles east of the village of Beclabito; 1,850 feet west and 750 feet south of the northeast corner of sec. 5, T.30N., R.20W.; latitude 36 degrees 50 minutes 53 seconds N and longitude 108 degrees 58 minutes 36 seconds W.

A—0 to 4 inches; brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; moderate medium platy structure parting to weak fine granular; soft, very friable, slightly sticky and nonplastic; few fine and common very fine roots; slightly effervescent; moderately alkaline; clear smooth boundary.

Btk—4 to 14 inches; strong brown (7.5YR 5/6) fine sandy loam, strong brown (7.5YR 4/6) moist; moderate medium prismatic structure parting to weak coarse subangular blocky; hard, firm, slightly sticky and slightly plastic; common fine and very fine roots; few very fine tubular pores; common thin clay films on faces of ped, lining pores, and bridging sand grains; strongly effervescent, secondary calcium carbonates segregated in few fine irregularly shaped accumulations on faces of ped; strongly alkaline; clear smooth boundary.

Btkn1—14 to 23 inches; light brown (7.5YR 6/4) with pinkish white (7.5YR 8/2) sandy clay loam, strong brown (7.5YR 4/6) with light brown (7.5YR 6/4) moist; weak medium prismatic structure parting to moderate coarse subangular blocky; very hard, very firm, slightly sticky and slightly plastic; few fine and common very fine roots; few very fine tubular pores; few thin clay films on faces of ped and bridging sand grains; violently effervescent, secondary calcium carbonates segregated in common medium and large irregularly shaped accumulations in soft masses and on faces of ped; strongly alkaline; clear irregular boundary.

Btkn2—23 to 36 inches; strong brown (7.5YR 5/6) sandy clay loam, strong brown (7.5YR 4/6) moist; moderate medium prismatic structure parting to moderate coarse subangular blocky; very hard, very firm, slightly sticky and slightly plastic; few fine and common very fine roots; few very fine tubular pores; few thin clay films on faces of ped, lining pores, and bridging sand grains; strongly effervescent, secondary calcium carbonates segregated in few medium irregularly shaped accumulations on faces of ped; strongly alkaline; abrupt wavy boundary.

2Bkn—36 to 45 inches; very pale brown (10YR 7/4) sandy clay loam, yellowish brown (10YR 5/4)

moist; moderate coarse subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few fine and very fine roots; few very fine tubular pores; 10 percent soft sandstone and 5 percent soft shale fragments; 5 percent channers; violently effervescent, secondary calcium carbonates segregated in few fine and medium irregularly shaped accumulations on faces of ped and on rock fragments; strongly alkaline; clear wavy boundary.

2BCkn—45 to 56 inches; light gray (10YR 7/1) clay loam, gray (10YR 5/1) moist; weak coarse subangular blocky structure; slightly hard, friable, sticky and plastic; few fine and very fine roots; common very fine tubular pores; 10 percent soft sandstone and 10 percent soft shale fragments; violently effervescent, secondary calcium carbonates segregated in common, fine and medium, irregularly shaped accumulations on faces of ped and on rock fragments; strongly alkaline; abrupt wavy boundary.

2R—56 inches; sandstone bedrock.

Range in Characteristics

Soil depth: 40 to 60 inches

Silicate clay content, control section weighted average: 18 to 35 percent

Depth to base of natric horizon: 20 to 40 inches

Depth to calcic horizon: 14 to 35 inches

Reaction: ranges from moderately alkaline in the surface to strongly alkaline in the subsoil

A horizon:

Hue: 5YR or 7.5YR

Value: 5 or 6 dry, 3 or 4 moist

Texture: fine sandy loam or very cobbly very fine sandy loam

Rock fragments: total range is 0 to 60 percent;

0 to 30 percent pebbles,

0 to 10 percent channers,

0 to 25 percent cobbles,

0 to 10 percent stones,

0 to 5 percent boulders

Salinity, mmhos/cm: 0 to 2

Sodicity, SAR: 0 to 5

Bt or Btk horizon:

Hue: 5YR or 7.5YR

Value: 5 or 6 dry

Chroma: 4 through 6

Texture: fine sandy loam, sandy clay loam or gravelly clay loam

Rock fragments: total range is 0 to 25 percent;

0 to 10 percent pebbles,

0 to 10 percent channers,
 0 to 5 percent cobbles
Salinity, mmhos/cm: 0 to 4
Sodicity, SAR: 5 to 30
Calcium carbonate equivalent: 5 to 10 percent

Btkn horizons:

Hue: 5YR or 7.5YR
Value: 5 through 8 dry, 4 through 6 moist
Chroma: 2 through 6
Texture: fine sandy loam, sandy clay loam, gravelly clay loam, or gravelly sandy clay loam
Clay content: 18 to 35 percent
Salinity, mmhos/cm: 0 to 8
Sodicity, SAR: 5 to 30
Calcium carbonate equivalent: 10 to 30 percent
Rock fragments: total range is 0 to 35 percent; 0 to 25 percent pebbles, 0 to 10 percent channers, 0 to 10 percent cobbles
Other features: 0 to 20 percent soft shale or sandstone fragments

2Bkn and 2BCkn horizons:

Hue: 2.5YR through 5GY
Value: 5 through 8 dry, 4 through 6 moist
Chroma: 1 through 6
Texture: sandy loam, fine sandy loam, sandy clay loam, clay loam, silty clay loam, or clay
Rock fragments: total range is 0 to 15 percent; 0 to 5 percent pebbles, 0 to 10 percent channers
Clay content: 10 to 50 percent
Salinity, mmhos/cm: 2 to 16
Sodicity, SAR: 13 to 30
Calcium carbonate equivalent: 5 to 40 percent
Other features: 5 to 60 percent soft shale or sandstone fragments; some pedons contain up to 5 percent secondary gypsum

The Beclabito soil in map unit 320 is a taxadjunct to the Beclabito series. This is because of a coarse-silty particle-size class, and a greater depth to high SAR material than allowed for the Haplic subgroup. In addition, this phase is moderately deep (20 to 40 inches) to soft bedrock. These differences, however, do not significantly affect use and management.

Benally Series

Classification: Fine-loamy, mixed, mesic Typic Natrargids

Depth class: Deep and very deep

Drainage class: Well drained

Permeability: Moderately slow or slow

Landform: Toeslopes and summits of mesas, plateaus, and structural benches; and eolian-mantled fan terraces

Parent material: Alluvium, eolian material, and residuum derived from sandstone and shale

Slope range: 0 to 5 percent

Elevation: 5,100 to 5,800 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Benally sandy clay loam, in an area of map unit 110—Brimhall-Benally-Genats association, 0 to 45 percent slopes; San Juan County, New Mexico; about 7 miles northeast of Sheep Springs; 2,000 feet west and 725 feet south of the northeast corner of sec. 6, T.22N., R.16W.; latitude 36 degrees 10 minutes 28 seconds N and longitude 108 degrees 35 minutes 3 seconds W.

A—0 to 1 inch; brown (7.5YR 5/4) sandy clay loam, brown (7.5YR 4/4) moist; strong coarse platy structure and moderate fine granular; soft, very friable, slightly sticky and slightly plastic; few very fine roots; few very fine vesicular pores; few 0.5 inch wide cracks; strongly effervescent; moderately alkaline; abrupt smooth boundary.

E/Btn—1 to 4 inches; light brown (7.5YR 6/4) clay loam, brown (7.5YR 5/4) moist; strong medium prismatic structure; very hard, firm, sticky and plastic; few fine and very fine roots; many very fine vertical tubular pores; upper 2 inches of prisms have uncoated sand grains (E part); few 0.5 inch wide cracks; few thin clay films and clay bridging sand grains on the faces of prisms (Bt part); strongly effervescent; very strongly alkaline; abrupt smooth boundary.

Btkn—4 to 11 inches; light brown (7.5YR 6/4) clay loam, brown (7.5YR 5/4) moist; moderate medium prismatic structure parting to moderate coarse blocks; hard, firm, sticky and plastic; few fine and common very fine roots; few very fine irregularly shaped pores; few thin clay films on faces of peds and lining pores; 5 percent pebbles; strongly effervescent; secondary calcium carbonates segregated in few fine irregularly shaped soft masses; very strongly alkaline; clear smooth boundary.

Byn—11 to 19 inches; light yellowish brown (10YR 6/4) clay loam, yellowish brown (10YR 5/4) moist;

moderate coarse and medium subangular blocky structure; hard, friable, sticky and plastic; few fine and common very fine roots; few very fine discontinuous interstitial pores; 5 percent pebbles; secondary very fine sand-sized gypsum crystals segregated in common fine irregularly shaped soft masses and filaments; strongly effervescent; very strongly alkaline; clear wavy boundary.

By—19 to 31 inches; very pale brown (10YR 7/3) clay loam, light yellowish brown (10YR 6/4) moist; weak coarse and moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; few very fine discontinuous interstitial pores; 5 percent pebbles secondary very fine sand sized gypsum crystals segregated in common fine irregularly shaped soft masses and filaments, primary coarse sand-sized gypsum crystals in common fine masses; slightly effervescent; strongly alkaline; clear wavy boundary.

2Cy—31 to 52 inches; very pale brown (10YR 7/3) channery sandy clay loam, yellowish brown (10YR 5/4) moist; massive, platy rock structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; 15 percent soft sandstone and shale fragments; 25 percent channers and 5 percent hard sandstone pebbles; secondary very fine sand-sized gypsum crystals segregated in few fine filaments and on the undersides of rock fragments, primary coarse sand-sized gypsum crystals in few fine masses; slightly effervescent; moderately alkaline; clear wavy boundary.

2Cr—52 inches; soft sandstone bedrock.

Range in Characteristics

Soil depth: 40 to 60 inches or more

Silicate clay content, control section, weighted average: 20 to 35 percent

Depth to secondary gypsum and base of natric horizon: 8 to 24 inches

Reaction: ranges from moderately alkaline to very strongly alkaline in the upper horizons, and neutral to moderately alkaline in the underlying horizons

A horizon:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

Texture: sandy clay loam, fine sandy loam, or loamy sand

E/Bt horizon:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

Texture: sandy clay loam or clay loam

Salinity, mmhos/cm: 4 to 8

Sodicity, SAR: 13 to 50

Btkn horizon:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

Texture: clay loam, loam, or sandy clay loam

Salinity, mmhos/cm: 4 to 16

Sodicity, SAR: 13 to 50

Calcium carbonate equivalent: 3 to 10 percent

By or BCy horizons:

Value: 5 through 7 dry, 4 through 6 moist

Chroma: 3 through 6

Texture: clay loam or sandy clay loam

Salinity, mmhos/cm: 8 to 25

Sodicity, SAR: 13 to 50

Gypsum content: 5 to 15 percent

Cy and C horizons:

Hue: 10YR or 2.5Y

Value: 6 or 7 dry, 4 through 6 moist

Chroma: 2 through 8

Texture: sandy clay loam, clay loam, channery sandy clay loam, channery clay loam, silty clay loam, or loamy sand

Rock fragments: total range is 0 to 35 percent;

0 to 25 percent channers,

0 to 10 percent pebbles

Salinity, mmhos/cm: 4 to 25

Sodicity, SAR: 5 to 80

Gypsum content: 0 to 15 percent

Other features: 0 to 30 percent soft sandstone and shale fragments

Berland Series

Classification: Loamy, mixed Lithic Argiborolls

Depth class: Very shallow

Drainage class: Well drained

Permeability: Moderate

Landform: Structural benches and knolls of undulating plateaus

Parent material: Alluvium derived from sandstone

Slope range: 1 to 15 percent

Elevation: 8,400 to 9,200 feet

Mean annual precipitation: 20 to 22 inches

Mean annual air temperature: 40 to 42 degrees F.

Frost-free period: 80 to 100 days

Typical Pedon

Berland loam, in an area of map unit 702—Bikeyah-Berland loams, 1 to 15 percent slopes; San Juan County, New Mexico; about 7 miles southwest of Toadlena; 1,600 feet south and 2,250 feet east of the northwest corner of sec. 13, T.22N., R.20W; latitude 36 degrees 8 minutes 36 seconds N and longitude 108 degrees 55 minutes 36 seconds W.

A—0 to 2 inches; brown (7.5YR 5/3) loam, dark brown (7.5YR 3/2) moist; moderate thick platy structure parting to moderate medium granular; soft, very friable, slightly sticky and slightly plastic; few fine and many very fine roots; common very fine irregularly shaped pores; 5 percent pebbles and channers; slightly acid; clear smooth boundary.

Bt1—2 to 6 inches; dark brown (7.5YR 4/3) loam, dark brown (7.5YR 3/3) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, sticky and slightly plastic; few fine and common very fine roots; common very fine tubular pores; 5 percent pebbles; few thin clay films on faces of peds and lining pores; slightly acid; clear smooth boundary.

Bt2—6 to 9 inches; dark brown (7.5YR 4/3) sandy clay loam, dark brown (7.5YR 3/3) moist; moderate medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; few very fine tubular pores; few thin clay films on faces of peds and lining pores; 5 percent pebbles and 5 percent channers; slightly acid; abrupt wavy boundary.

2R—9 inches; sandstone bedrock.

Range in Characteristics

Soil depth: 6 to 10 inches

Silicate clay content, control section weighted average: 20 to 35 percent

Depth to base of mollic epipedon: 6 to 10 inches

Depth to base of argillic horizon: 6 to 10 inches

Reaction: ranges from moderately acid in the surface to neutral in the subsoil

A horizon:

Chroma: 2 or 3

Rock fragments: total range is 0 to 15 percent; 0 to 5 percent pebbles,

0 to 5 percent channers (less than 3 inches long),

0 to 5 percent flagstones (less than 10 inches long)

Bt horizons:

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 or 4

Texture: loam, sandy clay loam, or clay loam

Rock fragments: total range is 0 to 15 percent;

0 to 5 percent pebbles,

0 to 10 percent channers (less than 3 inches long)

Bigpaw Series

Classification: Fine-silty, mixed Pachic Argiborolls

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Toeslopes below domes of mountain summits

Parent material: Eolian material and alluvium derived from sandstone, siltstone, and quartz diorite

Slope range: 5 to 15 percent

Elevation: 8,500 to 9,400 feet

Mean annual precipitation: 18 to 20 inches

Mean annual air temperature: 42 to 45 degrees F.

Frost-free period: 80 to 100 days

Typical Pedon

Bigpaw loam, in an area of map unit 618—Zibetod-Bigpaw complex, 5 to 35 percent slopes; Apache County, Arizona; about 9 miles southwest of Teec Nos Pos; 900 feet south and 925 feet west of the northeast corner of sec. 12, T.39N., R.29E; latitude 36 degrees 48 minutes 26 seconds N and longitude 109 degrees 10 minutes 40 seconds W.

A—0 to 5 inches; dark brown (7.5YR 4/2) loam, very dark brown (7.5YR 2/2) moist; moderate thick platy structure parting to weak medium granular; soft, very friable, slightly sticky and nonplastic; few fine and many very fine roots; common very fine irregularly shaped pores; slightly acid; clear smooth boundary.

Bt1—5 to 14 inches; dark reddish brown (5YR 3/2) loam, very dark gray (5YR 3/1) moist; weak medium prismatic structure parting to moderate coarse subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few medium, and common fine and very fine roots; few fine and common very fine tubular pores; common thin clay films on faces of peds and lining pores; neutral; gradual smooth boundary.

Bt2—14 to 36 inches; dark reddish brown (5YR 3/2) loam, very dark gray (5YR 3/1) moist; moderate

medium prismatic structure parting to weak coarse subangular blocky; hard, friable, slightly sticky and slightly plastic; few medium, few fine, and common very fine roots; common fine and common very fine tubular pores; few moderately thick and common thin clay films on faces of peds and lining pores; neutral; gradual wavy boundary.

Bt3—36 to 48 inches; dark reddish gray (5YR 4/2) loam, dark reddish brown (5YR 3/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; few fine and common very fine roots; few fine and common very fine tubular pores; few moderately thick and common thin clay films on faces of peds and lining pores; 5 percent pebbles; neutral; abrupt wavy boundary.

2Btb1—48 to 57 inches; reddish brown (5YR 5/4) with dark reddish gray (5YR 4/4) stony sandy clay loam, reddish brown (5YR 4/4) with dark reddish brown (5YR 3/2) moist; weak medium prismatic structure parting to moderate coarse subangular blocky; hard, friable, slightly sticky and slightly plastic; few fine and few very fine roots; few fine and many very fine tubular pores; few moderately thick and common thin clay films on faces of peds and on rock fragments; 15 percent stones, 5 percent cobbles, and 10 percent pebbles; neutral; clear wavy boundary.

2Btb2—57 to 65 inches; light brown (7.5YR 6/4) gravelly fine sandy loam, brown (7.5YR 5/4) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and few very fine roots; few fine and common very fine tubular pores; common thin clay films on faces of peds and on rock fragments; 20 percent pebbles, 5 percent cobbles, and 5 percent stones; neutral.

Range in Characteristics

Silicate clay content, control section weighted average: 18 to 27 percent

Depth of top of argillic horizon: 6 to 11 inches

Depth to base of mollic epipedon: 33 to 52 inches

Reaction: ranges from slightly acid to neutral

A horizon:

Hue: 5YR or 7.5YR

Value: 3 or 4 dry, 2 or 3 moist

Chroma: 1 or 2

Bt horizon:

Hue: 5YR or 7.5YR

Value: 3 or 4 dry, 2 or 3 moist

Chroma: 1 or 2

Rock fragments: 0 to 5 percent pebbles

2Btb1 horizon:

Hue: 5YR or 7.5YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 2 through 6

Texture: stony sandy clay loam or sandy clay loam

Rock fragments: total range is 5 to 30 percent;

5 to 10 percent pebbles,

0 to 5 percent cobbles,

0 to 15 percent stones

2Btb2 horizon:

Hue: 5YR or 7.5YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 through 6

Texture: stratified very gravelly fine sandy loam to sandy clay loam

Rock fragments: total range is 10 to 35 percent;

10 to 20 percent pebbles,

0 to 10 percent cobbles,

0 to 5 percent stones

Other features: some pedons have few, fine, distinct or prominent, 7.5YR relict redox concentrations

Bikeyah Series

Classification: Coarse-loamy, mixed Pachic Haploborolls

Depth class: Very deep

Drainage class: Somewhat poorly drained

Permeability: Moderate

Landform: Toeslopes of undulating high plateaus

Parent material: Alluvium derived from sandstone

Slope range: 1 to 15 percent

Elevation: 8,400 to 9,200 feet

Mean annual precipitation: 20 to 22 inches

Mean annual air temperature: 40 to 42 degrees F.

Frost-free period: 80 to 100 days

Typical Pedon

Bikeyah loam, in an area of map unit 702—Bikeyah-Berland loams, 1 to 15 percent slopes; San Juan County, New Mexico; about 7 miles southwest of Toadlena; 1,400 feet east and 1,400 feet south of the

northwest corner of sec. 13, T.22N., R.20W.; latitude 36 degrees 8 minutes 38 seconds N and longitude 108 degrees 55 minutes 47 seconds W.

A—0 to 5 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; strong medium granular structure; soft, very friable, slightly sticky and nonplastic; few fine and common very fine roots; common very fine irregularly shaped pores; slightly acid; clear smooth boundary.

AB—5 to 14 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak coarse subangular blocky structure parting to moderate medium granular; soft, very friable, slightly sticky and nonplastic; many very fine roots; few fine and common very fine tubular pores; slightly acid; gradual smooth boundary.

Bw1—14 to 22 inches; dark grayish brown (10YR 4/2) fine sandy loam; very dark grayish brown (10YR 3/2) moist; few fine distinct brown (7.5YR 4/4) redox concentrations; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few fine and common very fine roots; few fine and common very fine tubular pores; slightly acid; gradual smooth boundary.

Bw2—22 to 29 inches; grayish brown (10YR 5/2) fine sandy loam, dark brown (10YR 3/3) moist; common fine and medium prominent yellowish red (5YR 5/8) redox concentrations; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few fine and common very fine roots; few fine and common very fine tubular pores; slightly acid; clear wavy boundary.

BCg—29 to 41 inches; light gray (10YR 7/2) sandy loam, light brownish gray (10YR 6/2) moist; many medium and coarse prominent yellowish brown (10YR 5/8) redox concentrations and common medium distinct dark gray (10YR 4/1) redox depletions; weak very coarse subangular blocky structure; hard, firm, slightly sticky and nonplastic; common very fine roots; few fine and common very fine tubular pores; few laminae of sandy clay; slightly acid; clear wavy boundary.

Cg1—41 to 53 inches; light gray (10YR 7/2) sandy loam, light brownish gray (10YR 6/2) moist; common fine and medium prominent olive yellow

(2.5Y 6/8) redox concentrations and few fine prominent gray (5Y 5/1) redox depletions; massive; hard, firm, slightly sticky and nonplastic; few very fine roots; few very fine tubular pores; few laminae of sandy clay; slightly acid; abrupt wavy boundary.

Cg2—53 to 65 inches; light gray (10YR 7/2) sandy loam, light brownish gray (10YR 6/2) moist; common medium prominent olive yellow (2.5Y 6/8) redox concentrations and few fine faint gray (10YR 6/1) redox depletions; massive; hard, friable, slightly sticky and nonplastic; few very fine roots; few very fine tubular pores; few laminae of sandy clay; moderately acid.

Range in Characteristics

Silicate clay content, control section weighted average: 10 to 18 percent

Depth to base of mollic epipedon: 18 to 35 inches

Reaction: ranges from moderately acid to slightly acid

Depth to seasonal high water table: 2.0 to 3.5 feet

A horizon:

Value: 3 or 4 dry, 2 or 3 moist

Chroma: 1 or 2

AB horizon:

Value: 3 or 4 dry, 2 or 3 moist

Chroma: 1 or 2

Texture: loam or fine sandy loam

Bw horizons:

Hue: 7.5YR or 10YR

Value: 3 through 6 dry, 2 through 5 moist

Chroma: 1 through 3

Texture: fine sandy loam or sandy loam

Redoximorphic features: few to common, fine to medium, faint to prominent, dark brown, strong brown, or yellowish red redox concentrations

BC horizon:

Hue: 7.5YR or 10YR

Value: 5 through 7 dry, 3 through 6 moist

Chroma: 2 or 3

Texture: sandy loam, fine sandy loam, or sandy clay loam

Clay content: 10 to 25 percent

Redoximorphic features: common to many, fine to coarse, distinct to prominent, strong brown or yellowish brown redox concentrations, and dark

gray redox depletions; strong gleying is also present in horizons with a dominant matrix chroma of 2

Other features: some pedons have thin strata or laminae of clay loam or sandy clay

C horizons:

Hue: 7.5YR through 2.5Y

Value: 6 or 7 dry, 4 through 7 moist

Chroma: 2 or 3

Texture: sandy loam, fine sandy loam, or sandy clay loam

Clay content: 10 to 25 percent

Redoximorphic features: few to common, fine to medium, faint to prominent, strong brown or olive yellow redox concentrations, and dark gray or gray redox depletions; strong gleying is also present in horizons with a dominant matrix chroma of 2

Other features: some pedons have thin strata or laminae of clay loam or sandy clay

Blackston Series

Classification: Loamy-skeletal, mixed, mesic Typic Calciorthids

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate in the upper part and rapid or very rapid in the lower part

Landform: Treads of high stream terraces and fan terraces

Parent material: Alluvium derived from sandstone, quartzite, granite, and quartz diorite

Slope range: 0 to 8 percent

Elevation: 4,600 to 5,500 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Blackston gravelly sandy loam, in an area of map unit 102—Blackston-Camac-Rock outcrop complex, 0 to 60 percent slopes; San Juan County, New Mexico; within the town of Shiprock; 2,650 feet south and 450 feet west of the northeast corner of sec. 30, T.30N., R.17W.; latitude 36 degrees 47 minutes 7 seconds N and longitude 108 degrees 39 minutes 57 seconds W.

A—0 to 3 inches; brown (10YR 5/3) gravelly sandy loam, brown (10YR 4/3) moist; moderate coarse platy structure parting to moderate fine granular;

soft, very friable, slightly sticky and nonplastic; common very fine and fine roots; few fine and very fine vesicular pores; 10 percent pebbles and 5 percent cobbles; strongly effervescent; moderately alkaline; clear smooth boundary.

Bw—3 to 9 inches; light yellowish brown (10YR 6/4) sandy loam, dark yellowish brown (10YR 4/4) moist; moderate coarse subangular blocky structure; soft, very friable, slightly sticky and nonplastic; common fine and very fine roots; few fine vesicular pores; 2 percent pebbles; violently effervescent, secondary calcium carbonates segregated as few fine irregularly shaped accumulations on faces of peds; moderately alkaline; clear smooth boundary.

Bk1—9 to 15 inches; pale brown (10YR 6/3) gravelly sandy clay loam, dark yellowish brown (10YR 4/4) moist; strong medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few medium and fine, and common very fine roots; few fine tubular pores; 25 percent pebbles and 5 percent cobbles; violently effervescent, secondary calcium carbonates segregated as common medium irregularly shaped accumulations on faces of peds and on rock fragments; moderately alkaline; clear smooth boundary.

2Bk2—15 to 35 inches; pale brown (10YR 6/3) very gravelly coarse sandy loam, brown (10YR 4/3) moist; massive; soft, very friable, slightly sticky and nonplastic; few medium and common fine and very fine roots; 30 percent pebbles and 15 percent cobbles; violently effervescent, secondary calcium carbonates segregated as many fine and medium irregularly shaped accumulations on rock fragments; moderately alkaline; clear wavy boundary.

2Ck—35 to 53 inches; pale brown (10YR 6/3) very cobbly loamy coarse sand, brown (10YR 4/3) moist; single grain; loose, nonsticky and nonplastic; few medium, many fine, and common very fine roots; 30 percent pebbles, 20 percent cobbles, and 5 percent stones; strongly effervescent, secondary calcium carbonates segregated as common coarse irregularly shaped accumulations on rock fragments; moderately alkaline; clear wavy boundary.

2C—53 to 70 inches; light brownish gray (10YR 6/2) very cobbly coarse sand, brown (10YR 4/3) moist; single grain; loose, nonsticky and

nonplastic; few very fine and fine roots; 35 percent pebbles, 20 percent cobbles, and 5 percent stones; moderately alkaline.

Range in Characteristics

Silicate clay content: 10 to 35 percent in upper part of control section; 0 to 8 percent in lower part

Rock fragment content, control section weighted average: 40 to 65 percent

Depth to calcic horizon: 7 to 20 inches

Depth to contrasting sandy materials: 25 to 35 inches

Reaction: ranges from moderately alkaline to strongly alkaline

A horizon:

Hue: 5YR through 10YR

Value: 5 or 6 dry

Chroma: 3 or 4

Texture: gravelly sandy loam or fine sandy loam

Rock fragments: total range is 5 to 30 percent;

5 to 20 percent pebbles,

0 to 10 percent cobbles

BA or Bw horizon:

Hue: 5YR through 10YR

Value: 6 or 7 dry, 4 or 5 moist

Chroma: 2 through 6

Texture: sandy loam or fine sandy loam

Rock fragments: 5 to 15 percent pebbles

Bk horizons:

Hue: 5YR through 10YR

Value: 6 or 7 dry, 4 or 5 moist

Chroma: 2 through 6

Texture: gravelly sandy clay loam, loam, or gravelly loam

Rock fragments: total range is 10 to 30 percent;

10 to 25 percent pebbles,

0 to 10 percent cobbles

Calcium carbonate equivalent: 10 to 40 percent

2Bk horizon:

Value: 6 or 7 dry, 4 or 5 moist

Chroma: 2 or 3

Rock fragments: total range is 35 to 55 percent;

25 to 40 percent pebbles,

10 to 15 percent cobbles

Calcium carbonate equivalent: 5 to 10 percent

2Ck and 2C horizons:

Hue: 5YR through 10YR

Value: 6 or 7 dry, 4 or 5 moist

Chroma: 2 through 6

Texture: very cobbly loamy coarse sand, very cobbly coarse sand, extremely gravelly loamy sand, or loamy sand

Rock fragments: total range is 5 to 80 percent;

5 to 60 percent pebbles,

0 to 20 percent cobbles,

0 to 5 percent stones

Calcium carbonate equivalent: 1 to 5 percent

Blanding Series

Classification: Fine-silty, mixed, mesic Ustalfic Haplargids

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Eolian-mantled fan terraces and mesas

Parent material: Eolian material derived from siltstone and sandstone

Slope range: 2 to 8 percent

Elevation: 5,500 to 6,500 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F.

Frost-free period: 130 to 150 days

Typical Pedon

Blanding very fine sandy loam, in an area of map unit 310—Millett-Blanding-Strych association, 2 to 50 percent slopes; Apache County, Arizona; about 9 miles north of Red Rock; 550 feet west and 2,150 feet south of the northeast corner of sec. 6, T.38N., R.31E.; latitude 36 degrees 43 minutes 52 seconds N and longitude 109 degrees 3 minutes 3 seconds W.

A—0 to 2 inches; reddish brown (5YR 5/4) very fine sandy loam, reddish brown (5YR 4/4) moist; moderate thick platy structure parting to moderate coarse granular; soft, very friable, slightly sticky and nonplastic; few medium to very fine roots; few very fine irregularly shaped pores; slightly effervescent; mildly alkaline; clear smooth boundary.

BA—2 to 9 inches; reddish brown (5YR 5/4) very fine sandy loam, reddish brown (5YR 4/4) moist; moderate coarse subangular blocky structure; soft, very friable, slightly sticky and nonplastic; common fine and few very fine roots; few fine tubular pores; very few thin clay films bridging sand grains; slightly effervescent; moderately alkaline; clear smooth boundary.

Bt—9 to 24 inches; yellowish red (5YR 5/6) loam, yellowish red (5YR 4/6) moist; weak coarse prismatic structure parting to moderate coarse subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; few fine tubular pores; common thin clay

films on faces of peds and lining pores; strongly effervescent; moderately alkaline; clear wavy boundary.

Btk1—24 to 32 inches; light reddish brown (5YR 6/4) loam, reddish brown (5YR 4/4) moist; moderate medium angular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; few very fine tubular pores; few thin clay films on faces of peds and lining pores; strongly effervescent, secondary calcium carbonates segregated as common medium irregularly shaped accumulations as soft masses; moderately alkaline; clear wavy boundary.

Btk2—32 to 52 inches; light reddish brown (5YR 6/4) loam, reddish brown (5YR 4/4) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; few very fine tubular pores; few thin clay films on faces of peds and lining pores; strongly effervescent, secondary calcium carbonates segregated as common fine and medium irregularly shaped accumulations on faces of peds; moderately alkaline; clear wavy boundary.

Btk3—52 to 63 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine tubular pores; few thin clay films on faces of peds and lining pores; strongly effervescent, secondary calcium carbonates segregated as few fine irregularly shaped accumulations on faces of peds; moderately alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 20 to 27 percent

Depth to base of argillic horizon: more than 60 inches

Reaction: ranges from mildly alkaline in the surface to moderately alkaline in the subsoil

A horizon:

Chroma: 4 through 6

BA horizon:

Chroma: 4 through 6

Texture: very fine sandy loam or loam

Very fine sand content: 35 to 60 percent

Bt and Btk horizons:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 through 6

Texture: loam or sandy clay loam

Very fine sand content: 35 to 60 percent

Calcium carbonate equivalent: 5 to 10 percent

Other features: some pedons have texture of very fine sandy loam with 18 to 20 percent clay content

Bluechief Series

Classification: Coarse-loamy, mixed, mesic Typic Calciorthids

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Moderately rapid

Landform: Eolian-mantled summits of structural benches

Parent material: Eolian material, alluvium, and residuum derived from sandstone

Slope range: 2 to 5 percent

Elevation: 4,800 to 5,600 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 54 to 56 degrees F.

Frost-free period: 150 to 170 days

Typical Pedon

Bluechief loamy fine sand, in an area of map unit 515—Piute-Bluechief-Rock outcrop complex, 2 to 25 percent slopes; Apache County, Arizona; about 5.5 miles southeast of Tes Nez lah; 1,350 feet east and 1,100 south of the northwest corner of sec. 15, T.40N., R.25E.; latitude 36 degrees 52 minutes 45 seconds N and longitude 109 degrees 39 minutes 20 seconds W.

A—0 to 5 inches; reddish brown (5YR 6/6) loamy fine sand, yellowish red (5YR 5/6) moist; moderate thick platy structure parting to weak fine granular; soft, very friable, nonsticky and nonplastic; few very fine roots; few very fine irregularly shaped pores; mildly alkaline; abrupt wavy boundary.

Bw—5 to 11 inches; yellowish red (5YR 5/6) very fine sandy loam, yellowish red (5YR 4/6) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few medium, fine, and very fine roots; few very fine tubular pores; slightly effervescent, secondary calcium carbonates segregated in very few fine irregularly shaped accumulations on faces of peds; moderately alkaline; clear smooth boundary.

Bk1—11 to 16 inches; reddish yellow (5YR 6/6) fine sandy loam, yellowish red (5YR 5/6) moist;

moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; few medium, fine, and very fine roots; few fine and very fine tubular pores; 5 percent pebbles; strongly effervescent, secondary calcium carbonates segregated in few fine irregularly shaped accumulations on faces of peds and on rock fragments; strongly alkaline; clear wavy boundary.

Bk2—16 to 22 inches; reddish yellow (5YR 7/6) fine sandy loam, reddish yellow (5YR 6/6) moist; moderate coarse subangular blocky structure; slightly hard, friable, slightly hard and nonplastic; few fine and very fine roots; few very fine tubular pores; 5 percent pebbles; violently effervescent, secondary calcium carbonates segregated in common, fine and medium, irregularly shaped accumulations on faces of peds and on rock fragments; strongly alkaline; clear wavy boundary.

2Bk3—22 to 29 inches; pink (5YR 8/4) fine sandy loam, pink (5YR 7/4) moist; moderate thick platy structure parting to weak medium subangular blocky; hard, friable, slightly sticky and nonplastic; few fine and very fine roots; few very fine irregularly shaped pores; 30 percent soft sandstone fragments; violently effervescent, secondary calcium carbonates segregated in many large irregularly shaped accumulations on faces of peds and on rock fragments; strongly alkaline; abrupt wavy boundary.

2R—29 inches; sandstone bedrock.

Range in Characteristics

Soil depth: 20 to 40 inches

Silicate clay content, control section weighted average: 10 to 16 percent

Depth to calcic horizon: 11 to 14 inches

Reaction: ranges from mildly alkaline in the surface to strongly alkaline in the substratum

A horizon:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 or 6

Bw horizon:

Hue: 2.5YR or 5YR

Chroma: 4 or 6

Texture: very fine sandy loam or fine sandy loam

Bk horizons:

Value: 6 through 8 dry, 5 through 7 moist

Chroma: 2 through 6

Rock fragments: 0 to 5 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

2Bk horizon:

Value: 6 through 8 dry, 5 through 7 moist

Chroma: 2 through 6

Texture: fine sandy loam or very fine sandy loam

Rock fragments: 0 to 5 percent pebbles

Calcium carbonate equivalent: 15 to 30 percent

Other features: 0 to 50 percent soft sandstone fragments

Blueflat Series

Classification: Fine, mixed, mesic Cambic Gypsiorthids

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Moderately slow

Landform: Toeslopes and footslopes below mesas and cuestas

Parent material: Alluvium and residuum derived from shale

Slope range: 2 to 10 percent

Elevation: 4,700 to 6,100 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Blueflat loam, in an area of map unit 122—Blueflat-Notal association, 2 to 10 percent slopes; San Juan County, New Mexico; about 10 miles north of Sanostee; 2,400 feet west and 600 feet south of the northeast corner of sec. 20, T.27N., R.19W.; latitude 36 degrees 33 minutes 58 seconds N and longitude 108 degrees 53 minutes 18 seconds W.

A—0 to 2 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; moderate thick platy structure parting to moderate very fine granular; soft, very friable, slightly sticky and slightly plastic; few very fine roots; few very fine vesicular pores; 10 percent channers; strongly effervescent; moderately alkaline; clear smooth boundary.

Bw—2 to 7 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; weak medium prismatic structure parting to moderate coarse subangular blocky; slightly hard, friable, sticky and plastic; common very fine and few fine roots; few very fine tubular pores; 2 percent channers;

strongly effervescent, secondary calcium carbonates segregated as very few fine irregularly shaped accumulations on faces of peds and in pores; moderately alkaline; abrupt smooth boundary.

2By1—7 to 14 inches; light brownish gray (2.5Y 6/2) gypsiferous material which is an apparent silty clay loam, grayish brown (2.5Y 5/2) moist; moderate coarse subangular blocky structure; hard, firm, sticky and plastic; common very fine and few fine roots; few very fine random tubular pores; 5 percent channers; secondary silt-sized gypsum crystals segregated in many fine and medium irregularly shaped masses and filaments on faces of peds and in pores; slightly effervescent; mildly alkaline; clear smooth boundary.

2By2—14 to 22 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to moderate coarse subangular blocky; hard, firm, sticky and plastic; few fine and common very fine roots; few very fine tubular pores; 10 percent soft shale fragments; 2 percent channers; secondary silt-sized gypsum crystals segregated in common, fine and medium irregularly shaped filaments on faces of peds and in pores; very slightly effervescent; mildly alkaline; abrupt wavy boundary.

2Cy—22 to 27 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive, platy rock structure; slightly hard, friable, sticky and plastic; few very fine roots; few very fine irregularly shaped pores; 60 percent soft shale fragments; secondary silt-sized gypsum crystals segregated as few fine and medium irregularly shaped filaments on faces of peds and in pores; neutral; clear smooth boundary.

2Cr—27 inches; shale bedrock.

Range in Characteristics

Soil depth: 20 to 40 inches

Silicate clay content, control section weighted average: 35 to 45 percent

Depth to gypsic horizon: 6 to 17 inches

Reaction: ranges from moderately alkaline in the surface to neutral in the underlying horizons

A horizon:

Value: 5 or 6 dry, 4 or 5 moist

Rock fragments: 2 to 10 percent channers

By1 horizon:

Hue: 10YR or 2.5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 or 3

Texture: gypsiferous material which is an apparent silty clay loam or silty clay

Salinity, mmhos/cm: 4 to 8

Sodicity, SAR: 5 to 13

Gypsum content: 10 to 20 percent

Other features: 0 to 30 percent soft shale fragments

By2 and Cy horizons:

Hue: 10YR or 2.5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 or 3

Texture: silty clay loam or silty clay

Salinity, mmhos/cm: 8 to 16

Sodicity, SAR: 13 to 30

Gypsum content: 5 to 10 percent

Other features: 30 to 60 percent soft shale fragments

Bodot Series

Classification: Fine, montmorillonitic (calcareous), mesic Ustertic Torriorthents

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Slow

Landform: Backslopes of escarpments

Parent material: Colluvium and residuum derived from shale, claystone, and sandstone

Slope range: 35 to 65 percent

Elevation: 5,000 to 6,600 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F.

Frost-free period: 130 to 150 days

Typical Pedon

Bodot extremely gravelly clay loam, rubbly, in an area of map unit 307—Bodot-Beclabito-Rock outcrop complex, 15 to 65 percent slopes; San Juan County, New Mexico; about 17.5 miles west-southwest of Shiprock; 1,050 feet east and 100 feet south of the northwest corner of sec. 29, T.29N., R.20W.; latitude 36 degrees 42 minutes 18 seconds N and longitude 108 degrees 59 minutes 5 seconds W.

A—0 to 3 inches; light reddish brown (5YR 6/4) extremely gravelly clay loam, reddish brown (5YR 4/4) moist; moderate thick platy structure parting to moderate fine granular; soft, very friable, sticky and plastic; few fine and very fine roots; few very fine vesicular pores; common thin cracks 10 to 20 mm wide; 40 percent pebbles, 10 percent cobbles, 10 percent stones, and 15

percent boulders; strongly effervescent; moderately alkaline; clear wavy boundary.

2BA—3 to 8 inches; light reddish brown (5YR 6/4) silty clay, reddish brown (5YR 5/4) moist; weak medium prismatic structure parting to moderate coarse subangular blocky; hard, firm, very sticky and very plastic; few medium and fine and common very fine roots; few fine and very fine tubular pores; common thin cracks 10 to 20 mm wide; 5 percent pebbles and 5 percent cobbles; strongly effervescent; strongly alkaline; clear smooth boundary.

2BCy—8 to 14 inches; pinkish gray (5YR 7/2) with pink (5YR 7/4) silty clay loam, pinkish gray (5YR 6/2) with light reddish brown (5YR 6/4) moist; weak coarse subangular blocky structure; hard, firm, sticky and plastic; few fine and common very fine roots; few fine and very fine tubular pores; 15 percent soft shale fragments; common thin cracks 10 to 20 mm wide; 5 percent pebbles; secondary silt-sized gypsum crystals segregated in few, fine irregularly shaped accumulations on shale fragments; slightly effervescent; strongly alkaline; clear wavy boundary.

2C—14 to 24 inches; pinkish gray (5YR 7/2) silty clay loam, light reddish brown (5YR 6/3) moist; massive, platy rock structure; hard, firm, sticky and plastic; few fine and very fine roots; 50 percent soft shale fragments; secondary silt-sized gypsum crystals segregated in very few fine irregularly shaped accumulations on shale fragments; slightly effervescent; strongly alkaline; clear irregular boundary.

2Cr—24 inches; shale bedrock.

Range in Characteristics

Soil depth: 20 to 40 inches

Silicate clay content, control section weighted average: 35 to 55 percent

Reaction: ranges from mildly alkaline in the surface to strongly alkaline in the underlying horizons

A horizon:

Hue: 5YR through 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

Rock fragments: total range is 60 to 80 percent; 35 to 45 percent pebbles, 5 to 10 percent cobbles, 5 to 10 percent stones, 10 to 15 percent boulders

2BA horizon:

Hue: 5YR through 5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 1 through 4

Texture: silty clay, silty clay loam, or clay loam

Salinity, mmhos/cm: 2 to 4

Sodicity, SAR: 5 to 13

BCy and C horizons:

Hue: 5YR through 5Y

Value: 6 or 7 dry, 5 or 6 moist

Chroma: 1 through 4

Texture: silty clay loam or clay

Salinity, mmhos/cm: 2 to 8

Sodicity, SAR: 5 to 13

Gypsum content: 1 to 3 percent

Other features: 15 to 60 percent soft shale fragments

Bostwick Series

Classification: Fine-loamy, mixed Aridic Argiborolls

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Toeslopes and fan terraces

Parent material: Alluvium derived from sandstone and shale

Slope range: 1 to 5 percent

Elevation: 7,500 to 8,200 feet

Mean annual precipitation: 16 to 18 inches

Mean annual air temperature: 43 to 45 degrees F.

Frost-free period: 100 to 120 days

Typical Pedon

Bostwick fine sandy loam, in an area of map unit 602—Bostwick-Canburn complex, 0 to 5 percent slopes; San Juan County, New Mexico; about 7.5 miles southwest of Two Grey Hills Trading Post; 600 feet north and 1,200 feet east of the southwest corner of sec. 15, T.22N., R.19W.; latitude 36 degrees 8 minutes 6 seconds N and longitude 108 degrees 51 minutes 31 seconds W.

A1—0 to 3 inches; brown (7.5YR 5/2) fine sandy loam, dark brown (7.5YR 3/2) moist; moderate thick platy structure parting to moderate medium granular; soft, very friable, slightly sticky and nonplastic; few fine and very fine roots; few fine and very fine irregularly shaped pores; neutral; clear smooth boundary.

A2—3 to 10 inches; brown (7.5YR 5/2) fine sandy loam, dark brown (7.5YR 3/2) moist; weak medium subangular blocky structure; slightly

hard, very friable, slightly sticky and nonplastic; few coarse and common fine and very fine roots; few fine and very fine irregularly shaped pores; neutral; abrupt wavy boundary.

Bt1—10 to 17 inches; light brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 4/4) moist; moderate coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few medium and common fine and very fine roots; few fine and common very fine tubular pores; few thin clay films on faces of peds and bridging sand grains; mildly alkaline; clear smooth boundary.

Bt2—17 to 28 inches; brown (7.5YR 5/4) sandy clay loam, brown (7.5YR 4/4) moist; moderate medium prismatic structure parting to moderate medium angular blocky; very hard, firm, slightly sticky and slightly plastic; few medium and common fine and very fine roots; few medium and common fine and very fine tubular pores; common thin lamina of light brownish gray (10YR 6/2) clay loam; few moderately thick and common thin clay films on faces of peds and lining pores; neutral; abrupt smooth boundary.

Bt3—28 to 38 inches; brown (7.5YR 5/4) sandy clay loam, brown (7.5YR 4/4) moist; common fine distinct yellowish red (5YR 4/6) relict redox concentrations; weak medium prismatic structure parting to weak medium angular blocky; very hard, firm, slightly sticky and slightly plastic; few coarse and medium and common fine and very fine roots; few very fine and common fine tubular pores; common thin clay films on faces of peds and lining pores; mildly alkaline; abrupt smooth boundary.

Bt4—38 to 51 inches; yellowish brown (10YR 5/4) sandy clay loam, brown (10YR 4/3) moist, many large prominent strong brown (7.5YR 5/6) relict redox concentrations; weak thick platy structure parting to weak coarse subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; common fine and very fine tubular pores; few thin clay films on faces of peds and lining pores; mildly alkaline; abrupt smooth boundary.

C—51 to 65 inches; white (10YR 8/2) fine sandy loam, very pale brown (10YR 7/3) moist, many medium and large prominent reddish yellow (7.5YR 6/8) relict redox concentrations; massive; slightly hard, friable, slightly sticky and nonplastic; few fine and very fine roots; common very fine and few fine tubular pores; common thin

lamina of light brownish gray (10YR 6/2) clay loam; neutral.

Range in Characteristics

Silicate clay content, control section weighted average: 20 to 35 percent

Depth to base of mollic epipedon: 10 to 15 inches

Depth to base of argillic horizon: 39 to 60 inches

Reaction: ranges from neutral in the surface to mildly alkaline in the subsoil and substratum

A horizon:

Value: 4 or 5 dry

Chroma: 2 or 3

Bt horizons:

Hue: 5YR through 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 through 6

Texture: sandy clay loam or clay loam

Other features: some pedons contain redox concentrations which are relict in nature

C horizon:

Value: 6 through 8 dry, 5 through 7 moist

Chroma: 2 through 6

Texture: fine sandy loam or sandy loam

Other features: some pedons contain redox concentrations which are relict in nature

Brimhall Series

Classification: Coarse-loamy, mixed, mesic Calcic Gypsiorthids

Depth class: Deep

Drainage class: Well drained

Permeability: Moderately rapid

Landform: Knolls on mesas and structural benches

Parent material: Eolian material, alluvium, and residuum derived from sandstone

Slope range: 1 to 3 percent

Elevation: 5,500 to 5,800 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Brimhall loamy fine sand, in an area of map unit 110—Brimhall-Benally-Genats association, 0 to 45 percent slopes; San Juan County, New Mexico; about 6 miles northeast of Sheep Springs; 2,075 feet north and 1,000 feet east of the southwest corner of sec. 26, T.23N., R.17W.; latitude 36 degrees 11 minutes 48 seconds N and longitude 108 degrees 37 minutes 35 seconds W.

A—0 to 2 inches; yellowish brown (10YR 5/4) loamy fine sand, dark yellowish brown (10YR 4/4) moist; weak thin platy structure parting to weak fine granular; soft, very friable, slightly sticky and nonplastic; few fine and very fine roots; 5 percent pebbles; strongly effervescent; mildly alkaline; clear smooth boundary.

2Bw—2 to 5 inches; light yellowish brown (10YR 6/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak coarse and moderate medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; common medium, fine, and very fine roots; common very fine discontinuous tubular pores; 5 percent pebbles and channers; strongly effervescent; moderately alkaline; clear smooth boundary.

2Bk1—5 to 11 inches; light yellowish brown (10YR 6/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; moderate coarse subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; few medium and common fine and very fine roots; common very fine tubular pores; 5 percent pebbles and channers; violently effervescent, secondary calcium carbonates disseminated and also segregated in few fine irregularly shaped seams and as coatings on undersides of rock fragments; moderately alkaline; clear smooth boundary.

2Bk2—11 to 21 inches; very pale brown (10YR 7/3) fine sandy loam, light yellowish brown (10YR 6/4) moist; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common fine and very fine roots; few very fine tubular pores; 5 percent pebbles; violently effervescent, secondary calcium carbonates disseminated and also segregated in common fine and medium irregularly shaped soft masses and as coatings on rock fragments; moderately alkaline; clear wavy boundary.

3Bky—21 to 29 inches; white (10YR 8/1) fine sandy loam, very pale brown (10YR 7/3) moist; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few medium and common fine and very fine roots; few very fine discontinuous irregularly shaped pores; 5 percent pebbles and channers; secondary silt-sized gypsum crystals disseminated and also segregated in common fine irregularly shaped masses and as coatings on rock fragments; strongly effervescent,

secondary calcium carbonates disseminated and also segregated in few fine irregularly shaped seams; moderately alkaline; gradual smooth boundary.

3By—29 to 38 inches; white (10YR 8/2) gypsiferous material which is an apparent fine sandy loam, light yellowish brown (10YR 6/4) moist; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic, few fine and common very fine roots; few very fine discontinuous irregularly shaped pores; 5 percent channers and 5 percent pebbles; secondary silt-sized gypsum crystals disseminated and also segregated in many fine irregularly shaped masses and as coatings on rock fragments, primary sand-sized gypsum crystals in few fine masses; slightly effervescent; moderately alkaline; clear wavy boundary.

3BCy—38 to 49 inches; very pale brown (10YR 7/4) channery gypsiferous material which is an apparent fine sandy loam, yellowish brown (10YR 5/4) moist; weak coarse and medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few medium, fine, and very fine roots; few very fine discontinuous irregularly shaped pores; many thin strata of soft sandstone fragments; 15 percent channers and 5 percent pebbles; secondary silt-sized gypsum crystals segregated in few fine irregularly shaped masses and as coatings on undersides of rock fragments; primary sand-sized gypsum crystals present in common fine masses; moderately alkaline; clear wavy boundary.

3Cr—49 inches; soft sandstone bedrock with thin strata of soft gypsiferous shale.

Range in Characteristics

Soil depth: 40 to 60 inches

Silicate clay content, control section weighted average: 8 to 18 percent

Depth to calcic horizon: 2 to 16 inches

Depth to gypsic horizon: 16 to 35 inches

Reaction: ranges from mildly alkaline in the surface to moderately alkaline in the underlying horizons

A horizon:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

Bw and Bk horizons:

Value: 6 through 8 dry, 4 through 6 moist

Chroma: 2 through 4

Rock fragments: 0 to 5 percent pebbles, 0 to 5 percent channers

Calcium carbonate equivalent: 5 to 20 percent

Bky horizon:

Hue: 10YR or 2.5Y

Value: 7 or 8 dry, 6 or 7 moist

Chroma: 2 through 4

Salinity, mmhos/cm: 2 to 4

Sodicity, SAR: 0 to 5

Calcium carbonate equivalent: 5 to 10 percent

Gypsum content: 1 to 5 percent

By horizon:

Hue: 10YR, 2.5Y, or N (neutral)

Value: 7 or 8 dry, 5 through 7 moist

Chroma: 2 through 4

Texture: gypsiferous material which is an apparent fine sandy loam or sandy loam

Rock fragments: total range is 5 to 15 percent; 0 to 5 percent pebbles, 5 to 10 percent channers

Salinity, mmhos/cm: 4 to 16

Sodicity, SAR: 5 to 35

Calcium carbonate equivalent: 1 to 5 percent

Gypsum content: 15 to 30 percent

BCy and Cy horizons:

Hue: 10YR or 2.5Y

Value: 6 through 8 dry, 5 or 6 moist

Chroma: 2 through 4

Texture: channery gypsiferous material which is an apparent fine sandy loam or sandy loam

Rock fragments: total range is 15 to 35 percent; 0 to 5 pebbles, 15 to 30 channers (5 percent are longer than 3 inches)

Salinity, mmhos/cm: 4 to 16

Sodicity, SAR: 5 to 35

Gypsum content: 15 to 30 percent

Other features: 15 to 35 percent soft sandstone fragments

Cairn Series

Classification: Loamy-skeletal, carbonatic, mesic Typic Haplargids

Depth class: Deep

Drainage class: Well drained

Permeability: Moderate

Landform: Summits of structural benches and dipslopes of cuestas

Parent material: Alluvium and residuum derived from limestone and sandstone

Slope range: 1 to 5 percent

Elevation: 4,900 to 5,400 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Cairn channery fine sandy loam, in an area of map unit 137—Persayo-Cairn-Patel complex, 1 to 25 percent slopes; San Juan County, New Mexico; about 16 miles northwest of Shiprock; 2,600 feet south and 2,400 feet west of the northeast corner of sec. 31, T.32N., R.19W.; latitude 36 degrees 56 minutes 38 seconds N and longitude 108 degrees 53 minutes 21 seconds W.

A—0 to 2 inches; light brown (7.5YR 6/4) channery fine sandy loam, brown (7.5YR 4/4) moist; moderate very thick platy structure parting to weak fine granular; soft, very friable, slightly sticky and nonplastic; few fine and very fine roots; few very fine vesicular pores; 10 percent channers and 5 percent pebbles; violently effervescent; moderately alkaline; clear smooth boundary.

Btk—2 to 9 inches; brown (7.5YR 5/4) loam, brown (7.5YR 4/4) moist; weak medium prismatic structure parting to moderate thick platy; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; common very fine tubular pores; common thin clay films on faces of peds and lining pores; 5 percent channers and 5 percent pebbles; violently effervescent, secondary calcium carbonates segregated in few fine irregularly shaped accumulations on faces of peds and on rock fragments; moderately alkaline; clear wavy boundary.

2Bk—9 to 19 inches; very pale brown (10YR 7/3) very channery loam, light yellowish brown (10YR 6/4) moist; moderate medium platy structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few fine and common very fine roots; common very fine continuous horizontal pores; 15 percent flagstones, 35 percent channers, and 10 percent pebbles; secondary gypsum segregated in very few fine irregularly shaped pendants on undersides of rock fragments; violently effervescent, secondary calcium carbonates segregated in many medium irregularly shaped accumulations on faces of peds and on rock fragments; moderately alkaline; clear wavy boundary.

2Cky—19 to 30 inches; very pale brown (10YR 7/4)

extremely flaggy gypsiferous material which is an apparent coarse sandy loam, yellowish brown (10YR 5/6) moist; massive, platy rock structure; slightly hard, friable, slightly sticky and nonplastic; few medium and fine and common very fine roots; fine earth weakly cemented in places by secondary gypsum crystals; 35 percent flagstones, 30 percent channers, and 5 percent pebbles; secondary gypsum segregated in many medium and large irregularly shaped pendants on undersides of rock fragments; strongly effervescent; mildly alkaline; gradual wavy boundary.

2Cy—30 to 46 inches; light yellowish brown (10YR 6/4) very channery gypsiferous material which is an apparent coarse sandy loam, dark yellowish brown (10YR 4/4) moist; massive, platy rock structure; slightly hard, friable, slightly sticky and nonplastic; few medium and very fine roots; 35 percent channers, 15 percent flagstones, and 5 percent pebbles; secondary gypsum segregated in common medium irregularly shaped pendants on undersides of rock fragments; strongly effervescent; mildly alkaline; clear wavy boundary.

2Cr—46 inches; thinly interbedded soft calcareous sandstone and dolomitic limestone bedrock.

Range in Characteristics

Soil depth: 40 to 60 inches

Depth to base of argillic horizon: 4 to 10 inches

Depth to calcic horizon: 4 to 10 inches

Depth to gypsic horizon: 10 to 20 inches

Rock fragment content, control section weighted average: 40 to 60 percent

Calcium carbonate equivalent, <20 mm, control section weighted average: 40 to 60 percent

Reaction: ranges from mildly alkaline in the lower substratum to strongly alkaline in the upper substratum

A horizon:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 4 or 5 moist

Rock fragments: total range is 15 to 25 percent; 15 to 20 percent channers, 0 to 5 percent pebbles

Salinity, mmhos/cm: 2 to 4

Sodicity, SAR: 0 to 5

Calcium carbonate equivalent, <2 mm: 15 to 25 percent

Bt horizon:

Value: 5 or 6 dry, 4 or 5 moist

Texture: loam or clay loam

Clay content: 25 to 35 percent

Rock fragments: total range is 5 to 15 percent; 5 to 10 percent channers, 0 to 5 percent pebbles

Salinity, mmhos/cm: 2 to 4

Sodicity, SAR: 0 to 5

Calcium carbonate equivalent, <2 mm: 15 to 25 percent

Bk horizon:

Hue: 7.5YR or 10YR

Value: 6 or 7 dry, 5 or 6 moist

Chroma: 3 or 4

Clay content: 18 to 25 percent

Rock fragments: total range is 35 to 60 percent; 5 to 15 percent flagstones (0 to 5 percent are longer than 10 inches),

25 to 35 percent channers (10 to 15 percent are longer than 3 inches),

5 to 10 percent pebbles

Salinity, mmhos/cm: 2 to 4

Sodicity, SAR: 5 to 13

Calcium carbonate equivalent, <2 mm: 40 to 70 percent

Gypsum content: 0 to 5 percent

Other features: some pedons have textures of channery loam or very channery fine sandy loam

2Cky and 2Cy horizons:

Hue: 10YR or 2.5Y

Value: 5 through 8 dry, 4 through 6 moist

Chroma: 2 through 6

Texture: ranges from very channery gypsiferous material which is an apparent sandy loam to extremely flaggy gypsiferous material which is an apparent coarse sandy loam

Rock fragments: total range is 40 to 80 percent; 10 to 35 percent flagstones (10 to 25 percent are longer than 10 inches),

25 to 35 percent channers (15 to 20 percent are longer than 3 inches),

5 to 10 percent pebbles

Salinity, mmhos/cm: 2 to 8

Sodicity, SAR: 0 to 5

Calcium carbonate equivalent, <2 mm: 15 to 50 percent

Gypsum content: 20 to 50 percent

Camac Series

Classification: Fine-loamy, mixed, mesic Typic Camborthids

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Moderately slow

Landform: Risers of high stream terraces

Parent material: Alluvium derived from quartzite and residuum derived from siltstone and shale

Slope range: 15 to 60 percent

Elevation: 4,600 to 5,100 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Camac very cobbly fine sandy loam, in an area of map unit 102—Blackston-Camac-Rock outcrop complex, 0 to 60 percent slopes; San Juan County, New Mexico; within the town of Shiprock; 600 feet south and 150 feet west of the northeast corner of sec. 25, T.30N., R.18W.; latitude 36 degrees 47 minutes 26 seconds N and longitude 108 degrees 40 minutes 57 seconds W.

A—0 to 3 inches; brown (10YR 5/3) very cobbly fine sandy loam, brown (10YR 4/3) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; few fine and many very fine roots; 30 percent pebbles and 20 percent cobbles; strongly effervescent; moderately alkaline; clear smooth boundary.

2Bw—3 to 12 inches; light yellowish brown (10YR 6/4) gravelly loam, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and common very fine roots; few very fine irregularly shaped pores; 10 percent pebbles and 5 percent cobbles; strongly effervescent, secondary calcium carbonates segregated as few fine irregularly shaped accumulations on undersides of pebbles; moderately alkaline; clear smooth boundary.

2Bk—12 to 17 inches; pale brown (10YR 6/3) gravelly loam, brown (10YR 4/3) moist; moderate coarse subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few fine and very fine roots; common very fine tubular pores; 15 percent pebbles and 5 percent cobbles; strongly effervescent, secondary calcium carbonates segregated as common fine irregularly shaped accumulations on faces of pedis and on rock fragments; moderately alkaline; abrupt wavy boundary.

3Bck—17 to 22 inches; grayish brown (10YR 5/2) clay loam, dark yellowish brown (10YR 4/2) moist; weak coarse subangular blocky structure; hard, firm, sticky and plastic; common fine and

very fine roots; common very fine tubular pores; 5 percent pebbles; strongly effervescent, secondary calcium carbonates segregated as few fine irregularly shaped accumulations on faces of pedis and on rock fragments; strongly alkaline; clear wavy boundary.

3C—22 to 31 inches; gray (10YR 5/1) clay loam, dark gray (10YR 4/1) moist; massive, platy rock structure; slightly hard, friable, sticky and plastic; common fine and very fine roots; few very fine horizontal pores; 60 percent soft siltstone fragments; strongly effervescent; strongly alkaline; clear wavy boundary.

3Cr—31 inches; thinly interbedded siltstone and shale bedrock.

Range in Characteristics

Soil depth: 20 to 40 inches

Silicate clay content, control section weighted average: 18 to 35 percent

Depth to base of cambic horizon: 11 to 18 inches

Reaction: ranges from moderately alkaline in the surface to strongly alkaline in the subsoil and substratum

A horizon:

Value: 5 or 6 dry

Chroma: 3 or 4

Rock fragments: total range is 35 to 60 percent; 20 to 30 percent pebbles, 15 to 25 percent cobbles, 0 to 5 percent stones

Salinity, mmhos/cm: 0 to 4

Bw horizon:

Value: 5 or 6 dry

Chroma: 3 or 4

Texture: gravelly loam or gravelly fine sandy loam

Rock fragments: total range is 15 to 35 percent; 10 to 20 percent pebbles, 5 to 10 percent cobbles, 0 to 5 percent stones

Salinity, mmhos/cm: 0 to 4

Sodicity, SAR: 0 to 5

Bk horizon:

Value: 5 or 6 dry

Chroma: 2 through 4

Texture: gravelly loam or gravelly sandy clay loam

Rock fragments: total range is 15 to 35 percent; 10 to 20 percent pebbles, 5 to 10 percent cobbles, 0 to 5 percent stones

Salinity, mmhos/cm: 0 to 4

Sodicity, SAR: 0 to 5

Calcium carbonate equivalent: 5 to 15 percent

Other features: some pedons have thin horizons of silty clay loam

BC and C horizons:

Hue: 10YR or 2.5Y

Value: 4 through 6 dry, 3 through 5 moist

Chroma: 1 through 3

Texture: loam, clay loam, or silt loam

Salinity, mmhos/cm: 4 to 8

Sodicity, SAR: 5 to 13

Gypsum content: 0 to 1 percent

Other features: 10 to 60 percent soft siltstone fragments

Camino Series

Classification: Fine, mixed, mesic Ustollic Camborthids

Depth class: Very deep

Drainage class: Well drained

Permeability: Slow

Landform: Toeslopes

Parent material: Alluvium derived from shale and siltstone

Slope range: 1 to 8 percent

Elevation: 6,200 to 7,000 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F.

Frost-free period: 130 to 150 days

Typical Pedon

Camino silty clay loam, in an area of map unit 318—Camino silty clay loam, 1 to 8 percent slopes; San Juan County, New Mexico; about 4.5 miles west-southwest of Sanostee; 1,324 feet west and 1,500 feet south of the northeast corner of sec. 10, T.25N., R.20W.; latitude 36 degrees 25 minutes 7 seconds N and longitude 108 degrees 57 minutes 24 seconds W.

A—0 to 3 inches; brown (10YR 5/3) silty clay loam, brown (10YR 4/3) moist; moderate thick platy structure parting to weak fine granular; soft, very friable, sticky and plastic; few fine and very fine roots; common very fine vesicular pores; 5 percent pebbles; very slightly effervescent; mildly alkaline; clear smooth boundary.

Btn—3 to 9 inches; grayish brown (10YR 5/2) silty clay, brown (10YR 4/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, firm, very sticky and very plastic; common fine and very fine roots; few medium, fine, and very fine tubular pores; few moderately thick clay films on faces of peds

and lining pores; 5 percent pebbles; slightly effervescent; strongly alkaline; clear smooth boundary.

Btkn—9 to 28 inches; brown (10YR 5/3) silty clay loam, brown (10YR 4/3) moist; strong coarse prismatic structure; hard, firm, sticky and plastic; few fine and common very fine roots; few medium, fine, and very fine tubular pores; few thin clay films on faces of peds and lining pores; slightly effervescent, secondary calcium carbonates segregated in few fine irregularly shaped accumulations on faces of peds; strongly alkaline; clear wavy boundary.

Btky—28 to 52 inches; grayish brown (10YR 5/2) with brown (7.5YR 5/4) silty clay loam, dark grayish brown (10YR 4/2) with brown (7.5YR 4/4) moist; moderate coarse prismatic structure; hard, firm, sticky and plastic; few fine and common very fine roots; few fine and very fine tubular pores; few thin clay films on faces of peds and lining pores; 5 percent pebbles; secondary very fine sand-sized gypsum crystals segregated in few fine irregularly shaped accumulations on faces of peds and in filaments; strongly effervescent, secondary calcium carbonates segregated in few medium irregularly shaped accumulations on rock fragments; moderately alkaline; gradual smooth boundary.

Bky—52 to 68 inches; grayish brown (10YR 5/2) with brown (7.5YR 5/4) silty clay loam, dark grayish brown (10YR 4/2) with brown (7.5YR 4/4) moist; moderate coarse subangular blocky structure; slightly hard, friable, sticky and plastic; few fine and very fine roots; few very fine tubular pores; 5 percent pebbles; secondary very fine sand-sized gypsum crystals segregated in common fine irregularly shaped accumulations on faces of peds; slightly effervescent, secondary calcium carbonates segregated in few fine irregularly shaped accumulations on rock fragments; moderately alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 35 to 45

Rock fragments: 0 to 5 percent pebbles

Depth to base of natric horizon: 35 to 60 inches

Reaction: ranges from mildly alkaline in the surface to strongly alkaline in the subsoil

A horizon:

Value: 5 or 6 dry

Chroma: 2 or 3

Btn or Btkn horizons:*Value:* 5 or 6 dry*Chroma:* 2 or 3*Texture:* silty clay or silty clay loam*Salinity, mmhos/cm:* 0 to 2*Sodicity, SAR:* 5 to 30**Btky horizon:***Value:* 7.5YR or 10YR*Chroma:* 2 through 4*Texture:* silty clay loam or silty clay*Salinity, mmhos/cm:* 2 to 4*Sodicity, SAR:* 13 to 30*Calcium carbonate equivalent:* 5 to 10 percent*Gypsum content:* 2 to 5 percent**Bky or BCKy horizons:***Hue:* 7.5YR or 10YR*Value:* 5 through 7 dry, 4 or 5 moist*Chroma:* 2 through 4*Clay content:* 30 to 40 percent*Salinity, mmhos/cm:* 2 to 4*Sodicity, SAR:* 13 to 30*Calcium carbonate equivalent:* 1 to 5 percent*Gypsum content:* 2 to 5 percent

The Camino soil in the Shiprock Area is a taxadjunct to the Camino series because of the presence of a natric horizon. This difference, however, does not significantly affect use and management.

Canburn Series

Classification: Fine-loamy, mixed (calcareous), frigid
Cumulic Endoaquolls

Depth class: Very deep*Drainage class:* Poorly drained*Permeability:* Moderately slow*Landform:* Flood plains*Parent material:* Alluvium derived from sandstone and shale*Slope range:* 0 to 2 percent*Elevation:* 7,500 to 8,200 feet*Mean annual precipitation:* 16 to 18 inches*Mean annual air temperature:* 43 to 45 degrees F.*Frost-free period:* 100 to 120 days**Typical Pedon**

Canburn silt loam, in an area of map unit 602—Bostwick-Canburn complex, 0 to 5 percent slopes; San Juan County, New Mexico; about 7.5 miles southwest of Two Grey Hills Trading Post; 1,000 feet north and 850 feet east of the southwest corner of sec. 15, T.22N., R.19W.; latitude 36 degrees 8 minutes 9 seconds N and longitude 108 degrees 51 minutes 35 seconds W.

Soil surface is covered by 2 inches of matted roots and fibers; abrupt smooth boundary.

A1—0 to 2 inches; black (10YR 2/1) silt loam, dark grayish brown (10YR 4/2) dry; weak very thick platy structure parting to moderate fine granular; slightly hard, friable, sticky and slightly plastic; common fine and many very fine roots; few very fine irregularly shaped pores; strongly effervescent; mildly alkaline; abrupt smooth boundary.

A2—2 to 10 inches; black (N 2/0) silt loam, dark grayish brown (10YR 4/2) dry; strong medium granular structure; slightly hard, friable, sticky and slightly plastic; few medium, common fine and many very fine roots; few very fine irregularly shaped pores; strongly effervescent; mildly alkaline; clear smooth boundary.

A3—10 to 23 inches; black (N 2/0) silty clay loam, dark brown (7.5YR 4/2) dry; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; few medium and common fine and very fine roots; few fine and very fine tubular pores; slightly effervescent; mildly alkaline; abrupt smooth boundary.

A4—23 to 31 inches; black (N 2/0) clay loam, dark brown (7.5YR 4/2) dry; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; few fine and common very fine roots; common fine and very fine tubular pores; 5 percent pebbles; slightly effervescent; mildly alkaline; abrupt smooth boundary.

Cg1—31 to 43 inches; brown (7.5YR 4/2) fine sandy loam, dark brown (7.5YR 5/2) dry; weak medium subangular blocky structure; hard, friable, slightly sticky and nonplastic; few fine and very fine roots; few fine and very fine tubular pores; one 3-inch-thick stratum of clay loam with common fine prominent dark yellowish brown (10YR 4/6) redox concentrations; strongly effervescent; moderately alkaline; abrupt smooth boundary.

Cg2—43 to 56 inches; grayish brown (10YR 5/2) loamy sand, light brownish gray (10YR 6/2) dry, few medium prominent greenish gray (5G 6/1) redox depletions; massive; hard, friable, nonsticky and nonplastic; few fine and very fine roots; few very fine tubular pores; one 3-inch-thick stratum of clay loam; slightly effervescent; mildly alkaline; abrupt smooth boundary.

Cg3—56 to 65 inches; grayish brown (10YR 5/2) fine sandy loam, light brownish gray (10YR 6/2) dry, few medium prominent greenish gray (5G 6/1)

redox depletions; massive; hard, friable, slightly sticky and nonplastic; few fine and very fine roots; few fine and very fine tubular pores; slightly effervescent; mildly alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 20 to 35 percent

Rock fragment content: less than 10 percent pebbles

Depth to base of mollic epipedon: 25 to 35 inches

Reaction: ranges from mildly alkaline to moderately alkaline

Depth to seasonal high water table: 1.0 to 2.0 feet

A1 and A2 horizons:

Hue: 10YR or N (neutral)

Value: 2 or 3 moist, 4 or 5 dry

Chroma: 0 through 2

A3 and A4 horizons:

Hue: 7.5YR, 10YR, or N (neutral)

Value: 2 or 3 moist, 4 or 5 dry

Chroma: 0 through 2

Texture: silty clay loam or clay loam

Calcium carbonate equivalent: 5 to 10 percent

Cg horizons:

Value: 4 or 5 moist, 5 or 6 dry

Texture: stratified loamy sand to clay loam

Calcium carbonate equivalent: ranges from 5 to 10 percent in upper horizons, to 1 to 5 percent in the lower horizons

Redoximorphic features: few to common, fine to medium, distinct to prominent, brown or dark yellowish brown redox concentrations, and greenish gray redox depletions; a reduced matrix with chroma of 2 is also present

Captom Series

Classification: Loamy, mixed Arenic Eutroboralfs

Depth class: Deep

Drainage class: Well drained

Permeability: Rapid in the epipedon and moderate in the subsoil

Landform: Backslopes of high plateaus, mesas, and structural benches

Parent material: Colluvium and residuum derived from sandstone

Slope range: 35 to 60 percent

Elevation: 8,500 to 9,200 feet

Mean annual precipitation: 20 to 22 inches

Mean annual air temperature: 40 to 42 degrees F.

Frost-free period: 80 to 100 days

Typical Pedon

Captom very flaggy loamy sand, in an area of map unit 704—Klzhin-Captom complex, 15 to 60 percent slopes; San Juan County, New Mexico; about 6 miles southwest of Toadlena; 2,350 feet west and 500 feet north of the southeast corner of sec. 2, T.22N., R.20W.; latitude 36 degrees 10 minutes 2 seconds N and longitude 108 degrees 56 minutes 35 seconds W.

Soil surface is covered by 2 inches of oak leaves, pine needles, and twigs; abrupt smooth boundary.

A—0 to 8 inches; dark brown (7.5YR 4/2) very flaggy loamy sand, dark brown (7.5YR 3/2) moist; moderate medium granular structure; soft, very friable, slightly sticky and nonplastic; few medium and common fine and very fine roots; few very fine irregularly shaped pores; 20 percent flagstones, 15 percent channers, and 5 percent pebbles; neutral; clear smooth boundary.

E—8 to 13 inches; pinkish gray (7.5YR 6/2) very channery loamy sand, brown (7.5YR 4/2) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few coarse and common medium and very fine roots; few fine and very fine irregularly shaped pores; 25 percent channers, 10 percent pebbles, and 5 percent flagstones; neutral; clear wavy boundary.

E/Bt—13 to 32 inches; light brown (7.5YR 6/4) channery loamy sand; brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common very fine and fine roots; few fine and very fine irregularly shaped pores; common bleached sand grains (skeletons) on faces of peds; clay bridging on rock fragments and on sand grains in few thin lamellae less than 1 cm thick; 20 percent channers, 5 percent flagstones, and 5 percent pebbles; neutral; clear wavy boundary.

2Bt1—32 to 43 inches; reddish brown (5YR 5/4) sandy clay loam; yellowish red (5YR 4/6) moist; moderate coarse subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common fine and few very fine and coarse roots; few fine and very fine tubular pores; common thin clay films on faces of peds and lining pores; 5 percent pebbles; neutral; clear smooth boundary.

2Bt2—43 to 58 inches; reddish yellow (7.5YR 6/6) sandy loam, strong brown (7.5YR 5/6) moist; weak coarse subangular blocky structure; slightly

hard, friable, slightly sticky and nonplastic; few medium and very fine roots; few very fine tubular pores; few thin lamellae less than 1 cm thick, common thin clay films bridging sand grains; neutral; clear smooth boundary.

2Cr—58 inches; soft sandstone bedrock.

Range in Characteristics

Soil depth: 40 to 60 inches

Silicate clay content, control section weighted average: 18 to 27 percent

Rock fragment content, control section weighted average: 0 to 15 percent

Depth to albic horizon: 5 to 9 inches

Depth to lithologic discontinuity and loamy subsoil horizon: 20 to 40 inches

Reaction: ranges from slightly acid to neutral

A horizon:

Hue: 7.5YR or 10YR

Value: 3 through 5 dry, 2 or 3 moist

Rock fragments: total range is 35 to 60 percent; 5 to 10 percent pebbles, 10 to 15 percent channers, 0 to 5 percent cobbles, 20 to 30 percent flagstones (5 to 10 percent are longer than 10 inches)

E horizon:

Hue: 7.5YR or 10YR

Value: 5 through 7 dry, 4 or 5 moist

Chroma: 2 or 3

Texture: very channery loamy sand or very channery loamy fine sand

Rock fragments: total range is 35 to 60 percent; 5 to 10 percent pebbles, 20 to 35 percent channers (5 to 10 percent are longer than 3 inches), 10 to 15 percent flagstones (0 to 5 percent are longer than 10 inches)

E/Bt horizon:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 through 4

Texture: channery loamy sand or channery loamy fine sand

Rock fragments: total range is 15 to 35 percent; 5 to 10 percent pebbles, 10 to 20 percent channers (0 to 5 percent are longer than 3 inches), 0 to 5 percent flagstones

2Bt1 horizon:

Hue: 5YR or 7.5YR

Value: 5 or 6 dry

Chroma: 4 through 6

Texture: sandy clay loam or sandy loam

Clay content: 18 to 27 percent

Other features: 0 to 15 percent soft sandstone fragments present in some pedons

2Bt2 and 2BCt horizons:

Hue: 5YR or 7.5YR

Value: 5 through 7 dry, 4 or 5 moist

Chroma: 4 through 6

Texture: sandy loam or fine sandy loam

Clay content: 15 to 20 percent

Other features: 10 to 25 percent soft sandstone fragments present in some pedons

Chazner Series

Classification: Fine-loamy, mixed, mesic Petrocalcic Paleustalfs

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Moderate

Landform: Treads of fan terraces

Parent material: Alluvium derived from quartz diorite and sandstone

Slope range: 5 to 15 percent

Elevation: 6,200 to 7,200 feet

Mean annual precipitation: 12 to 14 inches

Mean annual air temperature: 48 to 50 degrees F.

Frost-free period: 130 to 150 days

Typical Pedon

Chazner very cobbly very fine sandy loam, extremely stony, in an area of map unit 402—Chazner very cobbly very fine sandy loam, 5 to 15 percent slopes, extremely stony; Apache County, Arizona; about 7.5 miles south-southeast of Teec Nos Pos; 100 feet east and 1,850 feet north of the southwest corner of sec. 6, T.39N., R.31E.; latitude 36 degrees 48 minutes 54 seconds N and longitude 109 degrees 4 minutes 1 second W.

A—0 to 2 inches; reddish brown (5YR 4/4) very cobbly very fine sandy loam, dark reddish brown (5YR 3/3) moist; moderate thick platy structure; soft, very friable, slightly sticky and nonplastic; common medium and few fine and very fine roots; few fine irregularly shaped pores; 25 percent cobbles, 20 percent pebbles, and 5 percent stones; very slightly effervescent; neutral; abrupt smooth boundary.

BA—2 to 6 inches; reddish brown (5YR 5/4) gravelly very fine sandy loam, dark reddish brown (5YR 3/4) moist; weak coarse subangular blocky structure; slightly hard, very friable, slightly

sticky and slightly plastic; common fine and very fine and few medium roots; common fine tubular pores; very few thin clay films on faces of peds and lining pores; 10 percent pebbles, 5 percent cobbles, and 3 percent stones; violently effervescent; moderately alkaline; clear smooth boundary.

Btk1—6 to 11 inches; reddish brown (5YR 5/4) gravelly sandy clay loam, dark reddish brown (5YR 3/4) moist; moderate coarse subangular blocky structure; hard, firm, sticky and plastic; common very fine and few fine and coarse roots; common fine and few medium tubular pores; common thin clay films on faces of peds and lining pores; 15 percent pebbles and 5 percent cobbles; violently effervescent, secondary calcium carbonates segregated as common medium irregularly shaped accumulations on rock fragments and as weakly cemented concretions; moderately alkaline; clear smooth boundary.

Btk2—11 to 18 inches; light brown (7.5YR 6/4) gravelly sandy clay loam, brown (7.5YR 5/4) moist; moderate medium subangular blocky structure; hard, friable, sticky and slightly plastic; common very fine and few coarse roots; common fine and medium tubular pores; common thin clay films on faces of peds and lining pores; 20 percent pebbles and 5 percent cobbles; violently effervescent, secondary calcium carbonates segregated as common medium irregularly shaped accumulations in soft masses and concretions and on faces of peds and on rock fragments; moderately alkaline; abrupt smooth boundary.

2Bk—18 to 29 inches; white (N 8/0) very cobbly coarse sandy loam, pinkish white (7.5YR 8/2) moist; weak coarse subangular blocky structure; extremely hard, extremely firm, slightly sticky and nonplastic; common very fine and few coarse roots; common fine and few very fine tubular pores; few lenses of reddish brown (5YR 5/4) fine sandy loam about 1 inch thick, dark reddish brown (5YR 4/4) moist; 35 percent cobbles, 15 percent pebbles, and 5 percent stones; violently effervescent, matrix is impregnated and partially cemented in places with secondary calcium carbonates; moderately alkaline; abrupt smooth boundary.

2Bkm—29 inches; indurated calcium carbonate pan with roots matted on thin laminar cap.

Range in Characteristics

Soil depth: 20 to 40 inches

Silicate clay content, control section weighted average: 18 to 35 percent

Depth to base of argillic horizon: 15 to 30 inches

Depth to calcic horizon: 6 to 12 inches

Reaction: ranges from neutral in the surface to moderately alkaline in the subsoil and substratum

A horizon:

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 or 4

Texture: very cobbly very fine sandy loam or very gravelly fine sandy loam

Rock fragments: total range is 35 to 60 percent; 20 to 30 percent pebbles, 10 to 25 percent cobbles, 0 to 5 percent stones

BA horizon:

Value: 3 or 4 moist

Chroma: 3 through 6

Texture: gravelly very fine sandy loam or gravelly fine sandy loam

Rock fragments: total range is 15 to 35 percent; 10 to 25 percent pebbles, 5 to 10 percent cobbles, 0 to 3 percent stones

Btk horizons:

Hue: 5YR or 7.5YR

Value: 5 through 7 dry, 3 through 6 moist

Chroma: 4 through 6

Texture: gravelly sandy clay loam or gravelly clay loam

Rock fragments: total range is 15 to 35 percent; 10 to 25 percent pebbles, 5 to 10 percent cobbles

Calcium carbonate equivalent, <2 mm: 40 to 70 percent

Bk horizon:

Hue: 5YR or 7.5YR

Value: 7 or 8 dry, 6 through 8 moist

Chroma: 0 through 4

Texture: very cobbly coarse sandy loam or very cobbly sandy loam

Rock fragments: total range is 35 to 60 percent; 10 to 20 percent pebbles,

25 to 35 percent cobbles,

0 to 5 percent stones

Calcium carbonate equivalent, <2 mm: 70 to 95 percent

Chinde Series

Classification: Fine, mixed, mesic Cambic Gypsiorthids

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately slow

Landform: Toeslopes and knolls of undulating plateaus

Parent material: Alluvium derived from shale

Slope range: 0 to 5 percent

Elevation: 5,200 to 5,600 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Chinde loam, in an area of map unit 220—Chinde loam, 0 to 5 percent slopes; San Juan County, New Mexico; about 18 miles south-southeast of Shiprock; 375 feet west and 325 feet south of the northeast corner of sec. 2, T.26N., R.17W.; latitude 36 degrees 31 minutes 25 seconds N and longitude 108 degrees 36 minutes 45 seconds W.

A—0 to 2 inches; light yellowish brown (10YR 6/4) loam, yellowish brown (10YR 5/4) moist; weak thin platy structure parting to moderate very fine granular; soft, very friable, slightly sticky and slightly plastic; few fine and medium roots; few very fine vesicular pores; 5 percent pebbles; strongly effervescent; moderately alkaline; clear smooth boundary.

By—2 to 6 inches; yellowish brown (10YR 5/4) gypsiferous material which is an apparent clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; slightly hard, very friable, sticky and plastic; few very fine and fine roots; few very fine and fine irregularly shaped pores; secondary gypsum crystals segregated in few fine irregularly shaped soft masses; few coarse sand and fine pebble-sized primary gypsum crystals; strongly effervescent; mildly alkaline; clear smooth boundary.

BCy—6 to 9 inches; yellowish brown (10YR 5/4) gypsiferous material which is an apparent clay loam, dark yellowish brown (10YR 4/4) moist;

weak coarse subangular blocky structure; slightly hard, very friable, sticky and plastic; few very fine and fine roots; few fine discontinuous tubular pores; secondary gypsum crystals segregated in few fine irregularly shaped soft masses, few fine pebble-sized primary gypsum crystals; slightly effervescent; moderately alkaline; clear wavy boundary.

Cn1—9 to 20 inches; yellowish brown (10YR 5/4) clay, dark yellowish brown (10YR 4/4) moist; weak fine subangular blocky structure parting to strong fine granular; hard, friable, sticky and plastic; few fine roots; few fine pebble-sized primary gypsum crystals; slightly effervescent; strongly alkaline; clear wavy boundary.

Cn2—20 to 33 inches; light olive brown (2.5Y 5/4) clay, olive brown (2.5Y 4/4) moist; weak fine subangular blocky structure parting to strong fine granular; hard, friable, sticky and plastic; few fine pebble-sized primary gypsum crystals; slightly effervescent; strongly alkaline; clear wavy boundary.

Cnz1—33 to 55 inches; olive brown (2.5Y 6/4) clay, olive brown (2.5Y 4/4) moist; weak fine subangular blocky structure parting to strong fine granular; hard, friable, sticky and plastic; few fine pebble-sized primary gypsum crystals; few fine irregularly shaped soft masses of sodium sulfate salts; slightly effervescent; strongly alkaline; clear wavy boundary.

Cnz2—55 to 64 inches; olive brown (2.5Y 6/4) clay, olive brown (2.5Y 4/4) moist; weak fine subangular blocky structure; hard, friable, sticky and plastic; few fine pebble-sized primary gypsum crystals; common fine and medium irregularly shaped soft masses of sodium sulfate salts; slightly effervescent; strongly alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 35 to 45 percent

Depth to gypsic horizon: 2 to 7 inches

Depth to salic horizon: 30 to 50 inches

Calcium carbonate equivalent: 3 to 5 percent

Reaction: ranges from mildly alkaline in the surface to strongly alkaline in the underlying material

A horizon:

Value: 5 or 6 dry, 3 through 5 moist

Salinity, mmhos/cm: 4 to 8

Sodicity, SAR: 5 to 13

By horizon:*Hue:* 10YR or 2.5Y*Value:* 5 or 6 dry*Chroma:* 3 or 4*Texture:* gypsiferous material which is an apparent clay loam or loam*Salinity, mmhos/cm:* 8 to 16*Sodicity, SAR:* 13 to 30*Gypsum content:* 10 to 20 percent**BCy horizon:***Hue:* 10YR or 2.5Y*Value:* 5 or 6 dry*Texture:* gypsiferous material which is an apparent clay loam or loam*Salinity, mmhos/cm:* 8 to 16*Sodicity, SAR:* 30 to 60*Gypsum content:* 5 to 15 percent**Cn horizons:***Hue:* 10YR or 2.5Y*Value:* 5 or 6 dry, 3 or 4 moist*Texture:* clay or clay loam*Salinity, mmhos/cm:* 8 to 16*Sodicity, SAR:* 30 to 60*Gypsum content:* 0 to 1 percent**Cnz horizons:***Value:* 5 or 6 dry*Texture:* clay or silty clay loam*Salinity, mmhos/cm:* 16 to 30*Total soluble salts:* 2.0 to 2.5 percent*Sodicity, SAR:* 80 to 160*Gypsum content:* 0 to 1 percent**Chinlini Series***Classification:* Fine-silty, mixed, mesic Petrocalcic Paleustalfs*Depth class:* Deep*Drainage class:* Well drained*Permeability:* Moderate*Landform:* Treads of fan terraces and summits of mesas*Parent material:* Eolian material and alluvium derived from siltstone, sandstone, and quartz diorite*Slope range:* 2 to 6 percent*Elevation:* 6,300 to 6,700 feet*Mean annual precipitation:* 12 to 14 inches*Mean annual air temperature:* 50 to 52 degrees F.*Frost-free period:* 130 to 150 days**Typical Pedon**

Chinlini loam, in an area of map unit 409—Chinlini loam, 2 to 6 percent slopes; Apache County, Arizona; about 7.5 miles east of Totacon (Sweetwater community); 2,300 feet west and 1,150 feet south of the northeast corner of sec. 2, T.39N., R.28E.; latitude 36 degrees 49 minutes 16 seconds N and longitude 109 degrees 17 minutes 21 seconds W.

A—0 to 3 inches; reddish brown (5YR 5/4) loam, reddish brown (5YR 4/4) moist; moderate very thick platy structure parting to moderate coarse granular; soft, very friable, slightly sticky and nonplastic; few fine and common very fine roots; few very fine interstitial pores; mildly alkaline; clear smooth boundary.

BA—3 to 9 inches; yellowish red (5YR 5/6) loam, yellowish red (5YR 4/6) moist; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common fine and few very fine roots; common very fine continuous tubular pores; few thin clay films lining pores; mildly alkaline; clear smooth boundary.

Bt1—9 to 16 inches; yellowish red (5YR 5/6) loam, yellowish red (5YR 4/6) moist; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few medium and very fine and common fine roots; common fine continuous tubular pores; common thin clay films on faces of peds and lining pores; strongly effervescent; moderately alkaline; clear wavy boundary.

Bt2—16 to 26 inches; yellowish red (5YR 5/6) loam, yellowish red (5YR 4/6) moist; moderate coarse angular blocky structure; slightly hard, friable, slightly sticky and plastic; few coarse to very fine roots; common fine continuous tubular pores; few moderately thick and common thin clay films on faces of peds and lining pores; strongly effervescent, secondary calcium carbonates segregated in very few fine irregularly shaped accumulations on faces of peds; moderately alkaline; clear smooth boundary.

Btk—26 to 38 inches; reddish brown (5YR 5/4) sandy clay loam, yellowish red (5YR 4/6) moist; moderate medium subangular blocky structure; very hard, firm, slightly sticky and slightly plastic; few fine and medium roots; common fine

continuous tubular pores; common thin clay films on faces of peds and lining pores; 10 percent pebbles; violently effervescent, secondary calcium carbonates segregated in common medium irregularly shaped accumulations on faces of peds; moderately alkaline; clear wavy boundary.

2Bk—38 to 50 inches; white (N 8/0) very gravelly coarse sandy loam, white (N 8/0) moist; massive; extremely hard, firm, slightly sticky and nonplastic; few fine and very fine roots; few very fine discontinuous tubular pores; 40 percent pebbles, 15 percent cobbles, and 2 percent stones; violently effervescent, matrix is impregnated with secondary calcium carbonates and forms thick coatings on rock fragments; strongly alkaline; clear wavy boundary.

2Bkm—50 inches; indurated calcium carbonate pan.

Range in Characteristics

Soil depth: 40 to 60 inches

Silicate clay content, control section weighted average: 18 to 27 percent

Depth to base of argillic horizon: 20 to 40 inches

Depth to calcic horizon: 38 to 43 inches

Reaction: ranges from mildly alkaline in the surface to strongly alkaline in the substratum

A horizon:

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 or 4

BA horizon:

Chroma: 4 or 6

Bt horizons:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 through 6

Texture: loam or sandy clay loam

Rock fragments: 0 to 5 percent pebbles

Btk horizon:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 through 6

Texture: sandy clay loam or loam

Rock fragments: 0 to 10 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

2Bk horizon:

Hue: 5YR or N (neutral)

Value: 7 or 8 dry, 6 through 8 moist

Chroma: 0 through 3

Texture: very gravelly coarse sandy loam or very gravelly sandy loam

Rock fragments: total range is 35 to 60 percent; 30 to 40 percent pebbles,

5 to 15 percent cobbles,

0 to 5 percent stones

Calcium carbonate equivalent: 15 to 30 percent

Chipeta Series

Classification: Clayey, mixed (calcareous), mesic, shallow Typic Torriorthents

Depth class: Shallow

Drainage class: Well drained

Permeability: Slow

Landform: Knolls, footslopes, and backslopes

Parent material: Alluvium and residuum derived from shale

Slope range: 2 to 35 percent

Elevation: 5,600 to 5,900 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Chipeta silty clay loam, in an area of map unit 150—Chipeta-Badland-Moncisco complex, 2 to 45 percent slopes; San Juan County, New Mexico; about 25 miles northeast of Sheep Springs; 1,150 feet west and 1,500 feet south of the northeast corner of sec. 1, T.23N., R.14W.; latitude 36 degrees 15 minutes 32 seconds N and longitude 108 degrees 16 minutes 30 seconds W.

A—0 to 2 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium platy structure parting to strong very fine granular; soft, very friable, sticky and plastic; few very fine roots; few very fine vesicular pores; 5 percent siderite pebbles; strongly effervescent; strongly alkaline; clear smooth boundary.

Byz—2 to 7 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure; hard, friable, sticky and plastic; few fine and common very fine roots; few very fine vesicular pores; few fine crystals of sodium sulfate salts on faces of peds; secondary gypsum segregated as few fine irregularly shaped accumulations on faces of peds; strongly effervescent; strongly alkaline; clear smooth boundary.

Cy—7 to 10 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive, platy rock structure; slightly hard, friable, sticky and plastic; few fine and common very fine roots; 40 percent soft shale fragments; secondary gypsum segregated as few fine

irregularly shaped accumulations in seams and filaments; strongly effervescent; strongly alkaline; clear smooth boundary.

Cr—10 inches; shale bedrock.

Range in Characteristics

Soil depth: 10 to 20 inches

Silicate clay content, control section weighted average: 35 to 60 percent

A horizon:

Hue: 10YR or 2.5Y

Value: 6 or 7 dry, 4 or 5 moist

Chroma: 2 or 4

Byz and Cy horizons:

Hue: 10YR or 2.5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 or 3

Texture: silty clay or clay

Salinity, mmhos/cm: 16 to 25

Sodicity, SAR: 30 to 60

Gypsum content: 1 to 5 percent

Other features: 0 to 50 percent soft shale fragments

Claysprings Series

Classification: Clayey, montmorillonitic (calcareous), mesic, shallow Typic Torriorthents

Depth class: Shallow

Drainage class: Well drained

Permeability: Very slow

Landform: Backslopes below structural benches, buttes, and hills; and scarp faces of cuestas

Parent material: Colluvium and residuum derived from shale, claystone, sandstone, and conglomerate

Slope range: 35 to 65 percent

Elevation: 4,700 to 6,000 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 52 to 56 degrees F.

Frost-free period: 140 to 170 days

Typical Pedon

Claysprings extremely gravelly sandy clay loam, rubbly, in an area of map unit 504—Tohona-Kimnoli-Claysprings complex, 2 to 45 percent slopes; San Juan County, New Mexico; about 11 miles north-northwest of Beclabito and 0.75 mile southeast of the Four Corners Monument; 500 feet north and 1,950 feet west of the southeast corner of sec. 24, T.32N., R.21W.; latitude 36 degrees 58 minutes 3 seconds N and longitude 109 degrees 0 minutes 46 seconds W.

A—0 to 2 inches; light brown (7.5YR 6/4) extremely

gravelly sandy clay loam, brown (7.5YR 4/4) moist; moderate thick platy structure parting to moderate fine granular; slightly hard, friable, slightly sticky and slightly plastic; few fine and common very fine roots; common very fine vesicular pores; 35 percent pebbles, 10 percent cobbles, 10 percent stones, and 10 percent boulders; strongly effervescent; mildly alkaline; abrupt wavy boundary.

2Bwn—2 to 5 inches; light reddish brown (5YR 6/4) and light brown (7.5YR 6/4) clay, reddish yellow (5YR 6/6) and brown (7.5YR 4/4) moist; weak medium prismatic structure parting to moderate coarse subangular blocky; very hard, very firm, very sticky and very plastic; few fine and common very fine roots; common very fine tubular pores; few thin cracks 3 to 5 mm wide filled with light brown sandy clay loam; 10 percent pebbles; strongly effervescent, secondary calcium carbonates segregated as very few fine irregularly shaped accumulations on faces of peds; strongly alkaline; clear smooth boundary.

2Cky—5 to 16 inches; pink (5YR 7/4) silty clay, reddish yellow (5YR 6/6) moist; massive, platy rock structure; hard, firm, very sticky and very plastic; few fine and very fine roots; few very fine irregularly shaped pores; 50 percent soft shale fragments; few thin cracks 3 to 5 mm wide filled with light brown sandy clay loam; ranges from very slightly to strongly effervescent, secondary calcium carbonates segregated as few fine irregularly shaped accumulations on rock fragments; secondary fine sand-sized gypsum crystals segregated as few fine irregularly shaped accumulations on rock fragments; moderately alkaline; clear wavy boundary.

2Cr—16 inches; shale bedrock.

Range in Characteristics

Soil depth: 10 to 20 inches

Silicate clay content, control section weighted average: 40 to 55 percent

Reaction: ranges from mildly alkaline in the surface to strongly alkaline in the underlying horizons

A horizon:

Hue: 7.5YR or 10YR

Chroma: 3 or 4

Rock fragments: total range is 60 to 80 percent; 35 to 45 percent pebbles, 5 to 10 percent cobbles, 5 to 10 percent stones, 10 to 15 percent boulders

2Bwn horizon:*Hue:* 5YR through 10YR*Value:* 6 or 7 dry, 4 through 6 moist*Chroma:* 1 through 6*Salinity, mmhos/cm:* 2 to 8*Sodicity, SAR:* 13 to 30**2Cky or 2Cy horizons:***Hue:* 5YR through 10YR*Value:* 5 through 7 dry, 4 through 6 moist*Chroma:* 1 through 6*Texture:* silty clay or clay*Gypsum content:* 2 to 5 percent*Salinity, mmhos/cm:* 4 to 16*Sodicity, SAR:* 13 to 30*Other features:* 30 to 50 percent soft shale or claystone fragments**Denazar Series***Classification:* Sandy, mixed, mesic Typic Calciorthids*Depth class:* Deep and very deep*Drainage class:* Somewhat excessively drained*Permeability:* Rapid or moderately rapid*Landform:* Eolian-mantled summits of plateaus and structural benches, and treads of high stream terraces*Parent material:* Eolian material, alluvium, and residuum derived from sandstone*Slope range:* 0 to 5 percent*Elevation:* 5,400 to 5,900 feet*Mean annual precipitation:* 5 to 8 inches*Mean annual air temperature:* 51 to 54 degrees F.*Frost-free period:* 140 to 160 days**Typical Pedon**

Denazar fine sand, in an area of map unit 115—Denazar-Farb fine sands, 0 to 3 percent slopes; San Juan County, New Mexico; about 5 miles east of Little Water; 2,075 feet west and 1,500 feet south of the northeast corner of sec. 3, T.25N., R.17W.; latitude 36 degrees 25 minutes 59 seconds N and longitude 108 degrees 38 minutes 11 seconds W.

A—0 to 4 inches; yellowish brown (10YR 5/4) fine sand, dark yellowish brown (10YR 4/4) moist; weak thin platy structure; loose, nonsticky and nonplastic; few fine and common very fine roots; neutral; clear smooth boundary.

Bw—4 to 14 inches; yellowish brown (10YR 5/4) fine sand, dark yellowish brown (10YR 4/4) moist; weak medium and fine subangular blocky

structure; soft, very friable, nonsticky and nonplastic; few medium and common fine and very fine roots; few very fine irregularly shaped pores; slightly effervescent; mildly alkaline; clear smooth boundary.

2Bk1—14 to 24 inches; very pale brown (10YR 7/4) loamy fine sand, brownish yellow (10YR 6/6) moist; moderate medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few medium and common fine and very fine roots; few very fine irregularly shaped pores; 5 percent channers and 5 percent pebbles; violently effervescent, secondary calcium carbonates disseminated and also segregated as common fine irregularly shaped accumulations on faces of peds and on rock fragments; moderately alkaline; clear wavy boundary.

2Bk2—24 to 31 inches; light yellowish brown (10YR 6/4) loamy fine sand, yellowish brown (10YR 5/6) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; few fine and common very fine roots; few very fine irregularly shaped pores; 25 percent soft sandstone fragments; strongly effervescent, secondary calcium carbonates segregated as common fine and medium irregularly shaped accumulations on faces of peds and on rock fragments; moderately alkaline; clear irregular boundary.

3C—31 to 42 inches; brownish yellow (10YR 6/6) fine sand, yellowish brown (10YR 5/8) moist; massive, platy rock structure; hard, friable, nonsticky and nonplastic; few fine and common very fine roots; 40 percent soft sandstone fragments; slightly effervescent; mildly alkaline; clear smooth boundary.

3Cr—42 inches; soft sandstone bedrock with interbedded hard strata 2 to 4 inches thick.

Range in Characteristics*Soil depth:* 40 to 60 inches or more*Silicate clay content, control section weighted average:* 2 to 10 percent*Depth to calcic horizon:* 10 to 35 inches*Reaction:* ranges from neutral in the surface to strongly alkaline in the underlying horizons**A horizon:***Hue:* 7.5YR or 10YR*Value:* 5 or 6 dry, 4 or 5 moist*Chroma:* 3 or 4

Bw horizon:*Hue:* 7.5YR or 10YR*Value:* 5 or 6 dry, 4 or 5 moist**Bk horizons:***Hue:* 7.5YR through 2.5Y*Value:* 5 through 8 dry, 4 through 7 moist*Chroma:* 2 through 6*Texture:* loamy fine sand or loamy sand*Rock fragments:* total range is 0 to 10 percent;

0 to 10 percent pebbles,

0 to 5 percent channers

Calcium carbonate equivalent: 5 to 15 percent*Other features:* 0 to 25 percent soft sandstone fragments**Bkb horizons (in very deep phase):***Value:* 6 through 8 dry, 5 through 7 moist*Texture:* sandy loam or loamy sand*Rock fragments:* 5 to 15 percent pebbles*Calcium carbonate equivalent:* 15 to 50 percent**Ck or C horizon:***Hue:* 10YR or 2.5Y*Value:* 6 through 8 dry, 5 or 6 moist*Chroma:* 1 through 6*Rock fragments:* 0 to 10 percent small channers or pebbles*Calcium carbonate equivalent:* 1 to 5 percent*Other features:* 30 to 50 percent soft sandstone fragments; some pedons contain up to 5 percent secondary gypsum**Deza Series***Classification:* Sandy, mixed Psammentic Eutroboralfs*Depth class:* Very deep*Drainage class:* Somewhat excessively drained*Permeability:* Rapid*Landform:* Toeslopes and footslopes of stable landslides*Parent material:* Alluvium derived from sandstone*Slope range:* 5 to 15 percent*Elevation:* 8,000 to 8,600 feet*Mean annual precipitation:* 18 to 20 inches*Mean annual air temperature:* 41 to 43 degrees F.*Frost-free period:* 90 to 100 days**Typical Pedon**

Deza sand, in an area of map unit 606—Narbona-Deza complex, 5 to 50 percent slopes, San Juan County, New Mexico; about 7.5 miles south of

Toadlena; 1,650 feet west and 200 feet south of the northeast corner of sec. 20, T.22N., R.19W.; latitude 36 degrees 7 minutes 58 seconds N and longitude 108 degrees 53 minutes 40 seconds W.

Soil surface is covered by 1 inch of pine needles, twigs, and leaves; abrupt smooth boundary.

A—0 to 4 inches; brown (7.5YR 5/3) sand, dark brown (7.5YR 3/2) moist; weak very coarse platy structure parting to moderate medium granular; soft, very friable, nonsticky and nonplastic; common very fine and fine and few medium roots; few very fine and fine tubular pores; 5 percent channers; moderately acid; clear wavy boundary.

E—4 to 16 inches; pinkish gray (7.5YR 6/2) sand, brown (7.5YR 5/3) moist; moderate coarse platy structure; soft, very friable, nonsticky and nonplastic; common very fine and fine and few coarse roots; few very fine and fine tubular pores; 5 percent channers and 5 percent pebbles; slightly acid; clear wavy boundary.

E and Bt1—16 to 31 inches; pinkish gray (7.5YR 6/2) sand (E part), brown (7.5YR 5/3) moist, with reddish brown (5YR 5/4) loamy sand lamellae (Bt part), reddish brown (5YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine and few medium and coarse roots; few very fine and fine tubular pores; clay coatings on sand grains in two lamellae less than 0.5 inches thick; 5 percent channers and 5 percent pebbles; slightly acid; abrupt wavy boundary.

E and Bt2—31 to 45 inches; pinkish gray (7.5YR 6/2) sand (E part), brown (7.5YR 5/3) moist, with reddish brown (5YR 5/4) loamy sand lamellae (Bt part), reddish brown (5YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and few fine and medium roots; few very fine and fine tubular pores; clay coatings on sand grains in four lamellae about 0.5 inches thick; 5 percent channers and 5 percent pebbles; slightly acid; abrupt wavy boundary.

E and Bt3—45 to 62 inches; pinkish gray (7.5YR 6/2) sand (E part), brown (7.5YR 5/3) moist, with reddish brown (5YR 5/4) loamy sand lamellae (Bt part), reddish brown (5YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and few fine and medium roots; few very fine and fine tubular pores; clay

coatings on sand grains in five lamellae about 1 inch thick; 5 percent pebbles; neutral.

Range in Characteristics

Silicate clay content, control section weighted average: 5 to 10 percent

Depth to albic horizon: 4 to 8 inches

Depth to argillic horizon: 28 to 38 inches (where lamellae are more than 1 cm thick)

Lamellae: sum of thickness is 6 to 12 inches or more at depths above 80 inches

Reaction: ranges from moderately acid in the surface to neutral in the subsoil

Depth to seasonal high water table: 5 to 6 feet

A horizon:

Value: 4 or 5 dry, 2 or 3 moist

Chroma: 2 or 3

Rock fragments: 0 to 5 percent channers

E horizon:

Value: 6 or 7 dry, 4 or 5 moist

Chroma: 2 or 3

Rock fragments: total range is 5 to 10 percent; 5 percent pebbles, 0 to 5 percent channers

E and Bt horizons:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 through 4

Texture: sand in matrix with loamy sand in lamellae

Rock fragments: total range is 5 to 10 percent; 5 percent pebbles, 0 to 5 percent channers

Other features: most pedons have upper subhorizons with few, very thin lamellae less than 1 cm thick

Doakum Series

Classification: Fine-loamy, mixed, mesic Ustalfic Haplargids

Depth class: Deep and very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Summits of mesas and toeslopes

Parent material: Eolian material and alluvium derived from sandstone and shale

Slope range: 1 to 15 percent

Elevation: 6,000 to 7,000 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F.

Frost-free period: 130 to 150 days

Typical Pedon

Doakum fine sandy loam, in an area of map unit

302—Doakum fine sandy loam, 1 to 10 percent slopes; San Juan County, New Mexico; about 2.5 miles southwest of Sanostee; 800 feet south and 300 feet east of the northwest corner of sec. 18, T.25N., R.19W.; latitude 36 degrees 24 minutes 22 seconds N and longitude 108 degrees 54 minutes 54 seconds W.

A—0 to 2 inches; brown (7.5YR 5/4) fine sandy loam, dark brown (7.5YR 3/4) moist; weak thin platy structure parting to weak fine granular; soft, very friable, slightly sticky and nonplastic; few fine and common very fine roots; few very fine vesicular pores; mildly alkaline; clear smooth boundary.

Bt—2 to 10 inches; brown (7.5YR 4/4) sandy clay loam, dark brown (7.5YR 3/4) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and common very fine roots; common very fine irregularly shaped pores; few thin clay films on faces of peds and lining pores; moderately alkaline; clear smooth boundary.

Btk—10 to 16 inches; brown (7.5YR 5/4) sandy clay loam, dark brown (7.5YR 4/4) moist; moderate coarse subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few fine and common very fine roots; common very fine tubular pores; very few thin clay films on faces of peds and lining pores; strongly effervescent, secondary calcium carbonates segregated as few fine irregularly shaped accumulations on faces of peds and in pores; strongly alkaline; clear smooth boundary.

Bk1—16 to 30 inches; light reddish brown (5YR 6/4) sandy clay loam, yellowish red (5YR 4/6) moist; weak medium prismatic structure parting to moderate coarse subangular blocky; hard, firm, slightly sticky and slightly plastic; few fine and very fine roots; common fine tubular pores; violently effervescent, secondary calcium carbonates segregated as common fine and medium irregularly shaped accumulations on faces of peds; strongly alkaline; clear smooth boundary.

Bk2—30 to 44 inches; light reddish brown (5YR 6/4) loam, yellowish red (5YR 4/6) moist; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; common fine tubular pores; violently effervescent, secondary calcium carbonates segregated as common fine irregularly shaped accumulations on faces of peds and in pores; strongly alkaline; clear smooth boundary.

B_{Ck}—44 to 53 inches; light reddish brown (5YR 6/4) loam; yellowish red (5YR 6/4) moist; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; common fine tubular pores; violently effervescent, secondary calcium carbonates segregated as few fine irregularly shaped accumulations on faces of peds and in pores; strongly alkaline; abrupt smooth boundary.

2R—53 inches; sandstone bedrock.

Range in Characteristics

Soil depth: 40 to more than 60 inches

Silicate clay content, control section weighted average: 20 to 27 percent

Depth to base of argillic horizon: 13 to 35 inches

Reaction: ranges from mildly alkaline in the surface to strongly alkaline in the substratum

A horizon:

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 or 4

B_t and B_{tk} horizons:

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 4 through 6

Texture: sandy clay loam or loam

Calcium carbonate equivalent: 0 to 10 percent

B_k, B_{Ck}, and B_{tkb} horizons:

Hue: 5YR or 7.5YR

Value: 5 through 7 dry, 4 or 5 moist

Chroma: 3 through 6

Texture: sandy clay loam, loam, or fine sandy loam

Calcium carbonate equivalent: 1 to 10 percent

Eagleeye Series

Classification: Clayey, mixed, nonacid, mesic, shallow Ustic Torriorthents

Depth class: Shallow

Drainage class: Well drained

Permeability: Slow

Landform: Foothills and backslopes of escarpments and structural benches

Parent material: Alluvium and residuum derived from shale and sandstone

Slope range: 15 to 60 percent

Elevation: 5,700 to 7,000 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F.

Frost-free period: 130 to 150 days

Typical Pedon

Eagleeye very channery clay loam, very bouldery, in an area of map unit 305—Strych-Eagleeye-Rock outcrop complex, 15 to 70 percent slopes, San Juan County, New Mexico; about 17 miles northeast of Shiprock; 650 feet north and 450 feet east of the southwest corner of sec. 16, T.32N., R.16W.; latitude 36 degrees 58 minutes 55 seconds N and longitude 108 degrees 32 minutes 13 seconds W.

A—0 to 2 inches; pale brown (10YR 6/3) very channery clay loam, brown (10YR 4/3) moist; moderate medium platy structure parting to moderate very fine granular; soft, friable, slightly sticky and slightly plastic; few very fine roots; common 0.25 to 0.5 inch wide cracks; 30 percent channers, 5 percent flagstones, and 5 percent boulders; very slightly effervescent; mildly alkaline; clear wavy boundary.

2B_w—2 to 8 inches; light yellowish brown (2.5Y 6/4) and gray (10YR 5/1) silty clay loam, light olive brown (2.5Y 5/4) and dark gray (10YR 4/1) moist; moderate very coarse prismatic structure parting to weak very thick platy; hard, firm, sticky and plastic; few medium and fine and common very fine roots; common 0.25 to 0.5 inch wide cracks; 15 percent soft shale fragments; mildly alkaline; clear smooth boundary.

2C_y—8 to 18 inches; light brownish gray (2.5Y 6/2) and gray (10YR 5/1) silty clay loam, grayish brown (2.5Y 5/2) and dark gray (10YR 4/1) moist; massive, platy rock structure; slightly hard, friable, sticky and plastic; few fine and common very fine roots; few 0.25 to 0.5 inch wide cracks; 60 percent soft shale fragments; secondary gypsum crystals segregated in very few fine accumulations on rock fragments; mildly alkaline; clear smooth boundary.

2C_r—18 inches; shale bedrock.

Range in Characteristics

Soil depth: 10 to 20 inches

Silicate clay content, control section weighted average: 35 to 50 percent

Reaction: ranges from mildly alkaline to moderately alkaline

A horizon:

Hue: 10YR or 2.5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 through 4

Rock fragments: total range is 35 to 60 percent;
20 to 30 percent channers,
5 to 15 percent flagstones,
0 to 5 percent stones,
0 to 10 percent boulders

2Bw and 2BC horizons:

Hue: 10YR or 2.5Y

Value: 4 through 6 dry, 3 through 5 moist

Chroma: 1 through 4

Texture: silty clay loam or silty clay

Salinity, mmhos/cm: 4 to 8

Sodicity, SAR: 0 to 5

Gypsum content: 0 to 2 percent

Other features: 0 to 20 percent soft shale fragments

2By and 2Cy horizons:

Hue: 10YR or 2.5Y

Value: 4 through 6 dry, 3 through 5 moist

Chroma: 1 through 4

Texture: silty clay loam or silty clay

Salinity, mmhos/cm: 4 to 16

Sodicity, SAR: 5 to 13

Gypsum content: 2 to 5 percent

Other features: 30 to 70 percent soft shale fragments

Escavada Series

Classification: Sandy, mixed, mesic Ustic
Torrifluvents

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Flood plains

Parent material: Alluvium derived from sandstone and
shale

Slope range: 0 to 1 percent

Elevation: 4,600 to 6,200 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 56 degrees F.

Frost-free period: 140 to 170 days

Typical Pedon

Escavada very fine sandy loam, in an area of map unit 160—Notal-Escavada-Riverwash association, 0 to 1 percent slopes; San Juan County, New Mexico; along the Chaco River about 9 miles southeast of Shiprock; 2,375 feet east and 1,400 feet south of the northwest corner of sec. 20, T.29N., R.16W.; latitude 36 degrees 42 minutes 57 seconds N and longitude 108 degrees 32 minutes 52 seconds W.

C1—0 to 2 inches; light brownish gray (10YR 6/2)

very fine sandy loam, dark grayish brown (10YR 4/2) moist; moderate thick platy structure parting to weak fine granular; soft, very friable, slightly sticky and nonplastic; few fine and very fine roots; slightly effervescent; mildly alkaline; clear smooth boundary.

C2—2 to 7 inches; pale brown (10YR 6/3) fine sand, dark grayish brown (10YR 4/2) moist; single grain; loose, nonsticky and nonplastic; common fine and very fine roots; very slightly effervescent; mildly alkaline; clear wavy boundary.

C3—7 to 12 inches; light brownish gray (10YR 6/2) very fine sandy loam, dark grayish brown (10YR 4/2) moist; moderate very thick platy structure; soft, very friable, slightly sticky and slightly plastic; common fine and very fine roots; few very fine irregularly shaped pores; slightly effervescent; moderately alkaline; abrupt wavy boundary.

C4—12 to 20 inches; pale brown (10YR 6/3) laminated fine sand, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few medium and fine and common very fine roots; 2 percent fine pebbles; very slightly effervescent; mildly alkaline; clear wavy boundary.

C5—20 to 30 inches; grayish brown (10YR 5/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, slightly sticky and nonplastic; common fine and very fine roots; few very fine irregularly shaped pores; few strata of loamy very fine sand 0.5 to 1 inch thick and few lamina of silty clay; slightly effervescent; moderately alkaline; clear wavy boundary.

C6—30 to 70 inches; light brownish gray (10YR 6/2) laminated fine sand, brown (10YR 5/3) moist; massive; soft, very friable, nonsticky and nonplastic; few medium and fine and common very fine roots; few strata of very fine sand and loamy very fine sand 0.5 to 1 inch thick; very slightly effervescent; mildly alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 2 to 10 percent

Rock fragment content, control section weighted average: 0 to 5 percent pebbles

Reaction: ranges from mildly alkaline to strongly alkaline

Depth to seasonal high water table: 5 to 6 feet

Flooding frequency: rare to occasional, very brief periods

Surface horizons:

Hue: 5YR through 10YR

Value: 5 through 7 dry, 4 through 6 moist

Chroma: 2 through 6

Texture: very fine sandy loam, loamy fine sand, or sand

Salinity, mmhos/cm: 0 to 2

Sodicity, SAR: 0 to 5

Underlying C horizons:

Hue: 5YR through 10YR

Value: 5 through 7 dry, 4 through 6 moist

Chroma: 2 through 4

Texture: stratified coarse sand to silty clay; most horizons are dominantly fine sand, loamy fine sand, and sand, with laminations and thin strata of very fine sand, loamy very fine sand, very fine sandy loam, silt loam and silty clay

Salinity, mmhos/cm: 0 to 8

Sodicity, SAR: 0 to 5

Eslendo Series

Classification: Loamy, mixed (calcareous), mesic, shallow Ustic Torriorthents

Depth class: Shallow

Drainage class: Well drained

Permeability: Moderate

Landform: Backslopes of escarpments

Parent material: Colluvium and residuum derived from sandstone, siltstone, and shale

Slope range: 35 to 70 percent

Elevation: 5,200 to 6,600 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F.

Frost-free period: 130 to 150 days

Typical Pedon

Eslendo very channery fine sandy loam, extremely bouldery, in an area of map unit 311—Kinusta-Eslendo-Rock outcrop complex, 15 to 70 percent slopes; Apache County, Arizona; about 7.5 miles south of Immanuel Mission; 250 feet east and 450 feet south of the northwest corner of sec. 24, T.38N., R.27E.; latitude 36 degrees 41 minutes 36 seconds N and longitude 109 degrees 23 minutes 18 seconds W.

A—0 to 3 inches; reddish brown (5YR 5/4) very channery fine sandy loam, reddish brown (5YR 4/4) moist; moderate very thick platy structure

parting to weak fine granular; soft, very friable, slightly sticky and nonplastic; few very fine roots; common very fine irregularly shaped pores; soil surface has a weak, patchy, black cryptogam crust; 35 percent channers, 10 percent flagstones, 5 percent stones, and 5 percent boulders; strongly effervescent; moderately alkaline; abrupt wavy boundary.

2C1—3 to 11 inches; brown (7.5YR 5/3) with light brownish gray (10YR 6/2) clay loam, brown (7.5YR 4/3) with dark grayish brown (10YR 4/2) moist; massive, platy rock structure; slightly hard, friable, sticky and plastic; few medium and fine and common very fine roots; 65 percent soft siltstone and sandstone fragments; strongly effervescent, secondary calcium carbonates segregated in very few fine irregularly shaped accumulations on rock fragments; moderately alkaline; clear smooth boundary.

2C2—11 to 18 inches; brown (7.5YR 5/2) with light brownish gray (2.5Y 6/2) loam, brown (7.5YR 4/2) with grayish brown (2.5Y 5/2) moist; massive, platy rock structure; hard, firm, slightly sticky and slightly plastic; few fine and very fine roots; 80 percent soft siltstone and sandstone fragments; strongly effervescent; strongly alkaline; clear smooth boundary.

2Cr—18 inches; interbedded siltstone and soft sandstone bedrock.

Range in Characteristics

Soil depth: 10 to 20 inches

Silicate clay content, control section weighted average: 18 to 30 percent

Reaction: ranges from moderately alkaline in the surface to strongly alkaline in the underlying horizons

A horizon:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 through 4

Rock fragments: total range is 35 to 60 percent; 30 to 40 percent channers, 5 to 10 percent flagstones, 0 to 5 percent stones, 0 to 5 percent boulders

C horizons:

Hue: 7.5YR through 2.5Y

Value: 5 through 7 dry, 4 through 6 moist

Chroma: 1 through 3

Texture: clay loam or loam

Other features: 60 to 80 percent soft siltstone, shale, and sandstone fragments

Espiritu Series

Classification: Loamy-skeletal, mixed, mesic Aridic Haplustalfs

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Stable landslides on escarpments

Parent material: Colluvium and residuum derived from sandstone and siltstone

Slope range: 35 to 75 percent

Elevation: 6,400 to 8,000 feet

Mean annual precipitation: 12 to 16 inches

Mean annual air temperature: 48 to 50 degrees F.

Frost-free period: 120 to 140 days

Typical Pedon

Espiritu extremely flaggy sandy loam, rubbly, in an area of map unit 418—Menefee-Espiritu-Rock outcrop complex, 35 to 75 percent slopes; San Juan County, New Mexico; about 8 miles southwest of Sanostee; 2,600 feet north and 1,400 feet east of the southwest corner of sec. 3, T.24N., R.20W.; latitude 36 degrees 20 minutes 35 seconds N and longitude 108 degrees 57 minutes 58 seconds W.

A—0 to 6 inches; brown (7.5YR 5/3) extremely flaggy sandy loam, brown (7.5YR 4/3) moist; weak thick platy structure parting to moderate fine granular; soft, very friable, slightly sticky and nonplastic; few coarse, medium, fine, and very fine roots; common very fine irregularly shaped pores; 25 percent flagstones, 15 percent boulders, 10 percent cobbles, 5 percent channers, 5 percent pebbles, and 5 percent stones; neutral; clear wavy boundary.

Bt1—6 to 10 inches; brown (7.5YR 5/3) very channery sandy loam, brown (7.5YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few coarse, and medium, and common fine and very fine roots; few fine and very fine tubular pores; few thin clay films on faces of peds and lining pores; 25 percent channers, 10 percent pebbles, 5 percent stones, and 5 percent boulders; neutral; clear wavy boundary.

Bt2—10 to 24 inches; brown (7.5YR 5/4) very cobbly sandy loam, brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few coarse and fine, and common medium and very fine roots; few fine and common very fine tubular pores; few thin clay films on faces of peds and lining pores, and common clay bridges between sand grains; 15 percent cobbles, 15 percent channers, 10 percent pebbles, and 10 percent stones; mildly alkaline; gradual wavy boundary.

Btk—24 to 42 inches; light brown (7.5YR 6/4) very cobbly sandy clay loam, brown (7.5YR 5/4) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few coarse, medium, fine, and very fine roots; few fine and very fine tubular pores; few thin clay films on faces of peds and lining pores, and common clay bridges between sand grains; 15 percent cobbles, 15 percent channers, 10 percent pebbles, and 5 percent stones; strongly effervescent, secondary calcium carbonates segregated in common, fine and medium, irregularly shaped accumulations on faces of peds and on rock fragments; moderately alkaline; clear wavy boundary.

2Ck1—42 to 55 inches; pale brown (10YR 6/3) cobbly very fine sandy loam, brown (10YR 5/3) moist; massive, angular rock structure; hard, firm, slightly sticky and nonplastic; few medium and fine, and common very fine roots; 25 percent soft, slakable very fine grained sandstone fragments; 15 percent cobbles, 10 percent channers, 5 percent pebbles, and 5 percent stones; violently effervescent, secondary calcium carbonates segregated in many medium and large irregularly shaped accumulations on rock fragments; moderately alkaline; gradual wavy boundary.

2Ck2—55 to 70 inches; pale brown (10YR 6/3) cobbly very fine sandy loam, brown (10YR 5/3) moist; massive, angular rock structure; hard, firm, slightly sticky and nonplastic; few medium, fine, and very fine roots; 25 percent soft, slakable very fine grained sandstone fragments; 20 percent cobbles, 5 percent channers, 5 percent pebbles, and 5 percent stones; strongly effervescent, secondary calcium carbonates segregated in common medium and large,

irregularly shaped accumulations on rock fragments; moderately alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 18 to 27 percent

Depth to base of argillic horizon: 23 to 45 inches

Reaction: ranges from neutral in the solum to moderately alkaline in the substratum

A horizon:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

Rock fragments: total range is 60 to 80 percent;

10 to 15 percent pebbles and channers (less than 3 inches long),

35 to 40 percent cobbles and flagstones (less than 10 inches long),

15 to 25 percent stones and boulders

Bt horizons:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

Texture: very channery sandy loam, very cobbly sandy loam, or very channery sandy clay loam

Rock fragments: total range is 35 to 60 percent;

25 to 35 percent pebbles and channers (less than 3 inches long),

5 to 15 percent cobbles,

5 to 10 percent stones and boulders

Btk horizon:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

Texture: very cobbly sandy clay loam or very cobbly clay loam

Clay content: 20 to 35 percent

Rock fragments: total range is 35 to 60 percent;

15 to 25 percent pebbles and channers (less than 3 inches long),

15 to 25 percent cobbles,

5 to 10 percent stones

Calcium carbonate equivalent: 3 to 5 percent

2Ck horizons:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 through 4

Texture: cobbly very fine sandy loam or cobbly fine sandy loam

Clay content: 8 to 18 percent

Rock fragments: total range is 15 to 25 percent;

5 to 10 percent pebbles and channers (less than 3 inches long),

10 to 20 percent cobbles,

0 to 5 percent stones

Calcium carbonate equivalent: 3 to 5 percent

Other features: 15 to 50 percent soft sandstone or siltstone fragments

Farb Series

Classification: Loamy, mixed (calcareous), mesic
Lithic Torriorthents

Depth class: Very shallow

Drainage class: Well drained

Permeability: Moderately rapid

Landform: Summits of plateaus, mesas, and structural benches, and dipslopes of cuestas

Parent material: Alluvium, eolian material, and residuum derived from sandstone

Slope range: 1 to 25 percent

Elevation: 4,900 to 6,100 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Farb channery loamy fine sand, in an area of map unit 135—Farb-Rock outcrop-Badland complex, 2 to 25 percent slopes; San Juan County, New Mexico; about 14 miles northeast of Sheep Springs; 200 feet south and 150 feet west of the northeast corner of sec. 29, T.23N., R.15W.; latitude 36 degrees 11 minutes 48 seconds N and longitude 108 degrees 27 minutes 9 seconds W.

A—0 to 2 inches; pale brown (10YR 6/3) channery loamy fine sand, yellowish brown (10YR 5/4) moist; moderate medium platy structure parting to moderate very fine granular; soft, very friable, slightly sticky and nonplastic; few fine and very fine roots; few very fine vesicular pores; 15 percent channers and 5 percent pebbles; slightly effervescent; mildly alkaline; clear smooth boundary.

BC—2 to 5 inches; very pale brown (10YR 7/3) fine sandy loam, light yellowish brown (10YR 6/4) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few fine and common very fine roots; few very fine tubular pores; 10 percent soft sandstone fragments; 5 percent channers; strongly effervescent; mildly alkaline; clear smooth boundary.

2C—5 to 8 inches; very pale brown (10YR 7/3) channery fine sandy loam, light yellowish brown (10YR 6/4) moist; massive, platy rock structure; slightly hard, friable, slightly sticky and nonplastic; few fine and very fine roots; 40 percent soft sandstone fragments; 15 percent channers; slightly effervescent, secondary calcium carbonates segregated as few fine irregularly shaped accumulations on rock fragments; moderately alkaline; clear wavy boundary.

2R—8 inches; sandstone bedrock.

Range in Characteristics

Soil depth: 5 to 10 inches

Silicate clay content, control section weighted average: 5 to 18 percent

Reaction: ranges from mildly alkaline to moderately alkaline

A horizon:

Hue: 7.5YR or 10YR

Value: 5 through 7 dry, 4 or 5 moist

Chroma: 3 or 4

Texture: channery loamy fine sand or fine sand

Rock fragments: total range is 5 to 20 percent; 5 to 15 percent channers, 0 to 5 percent pebbles

BC and C horizons:

Hue: 7.5YR or 10YR

Value: 5 through 7 dry, 4 through 6 moist

Chroma: 2 through 6

Texture: fine sandy loam, channery fine sandy loam, or channery sandy loam

Rock fragments: total range is 5 to 30 percent; 5 to 25 percent channers, 0 to 5 percent pebbles

Other features: 0 to 50 percent soft sandstone fragments

Farview Series

Classification: Loamy, mixed (calcareous), mesic Lithic Ustic Torriorthents

Depth class: Very shallow

Drainage class: Well drained

Permeability: Moderately rapid

Landform: Summits of mesas, structural benches, and dipslopes of cuestas

Parent material: Alluvium and eolian material derived from sandstone

Slope range: 1 to 10 percent

Elevation: 4,900 to 6,800 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F.

Frost-free period: 130 to 150 days

Typical Pedon

Farview channery loamy sand, in an area of map unit 301—Farview-Sanostee-Rock outcrop association, 1 to 10 percent slopes, San Juan County, New Mexico; about 3.5 miles south of Sanostee; 3,700 feet north and 1,350 feet east of the southwest corner of sec. 27, T.25N., R.19W.; latitude 36 degrees 52 minutes 29 seconds N and longitude 108 degrees 51 minutes 26 seconds W.

A—0 to 2 inches; light brown (7.5YR 6/4) channery loamy sand, brown (7.5YR 4/4) moist; weak thin platy structure parting to weak fine granular; soft, very friable, nonsticky and nonplastic; common fine and very fine roots; 15 percent channers and 5 percent pebbles; strongly effervescent; mildly alkaline; clear smooth boundary.

2Bck—2 to 6 inches; light brown (7.5YR 6/4) channery sandy loam, brown (7.5YR 4/4) moist; weak medium subangular blocky structure; soft, friable, slightly sticky and nonplastic; few fine and common very fine roots; 10 percent channers and 5 percent pebbles; violently effervescent, secondary calcium carbonates segregated in few fine and medium irregularly shaped accumulations on rock fragments; moderately alkaline; abrupt wavy boundary.

2R—6 inches; sandstone bedrock.

Range in Characteristics

Soil depth: 4 to 10 inches

Silicate clay content, control section weighted average: 10 to 18 percent

Reaction: ranges from mildly alkaline in the surface to moderately alkaline in the underlying horizons

A horizon:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 through 6

Texture: channery loamy sand or fine sandy loam

Rock fragments: total range is 5 to 20 percent; 0 to 5 percent pebbles,

5 to 15 percent channers (0 to 5 percent are longer than 3 inches)

Calcium carbonate equivalent: 5 to 10 percent

Bck or C horizons:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 4 or 5 moist

Texture: channery sandy loam, channery fine sandy loam, or fine sandy loam

Rock fragments: total range is 5 to 20 percent;
0 to 5 percent pebbles,
5 to 15 percent channers (0 to 5 percent are longer
than 3 inches)

Sand content: more than 25 percent fine sand or
coarser

Calcium carbonate equivalent: 15 to 20 percent

Fordbutte Series

Classification: Fine-silty, mixed, mesic Typic
Camborthids

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Moderate

Landform: Toeslopes below cuestas and knolls of
undulating plateaus

Parent material: Alluvium, eolian material, and
residuum derived from siltstone, sandstone, and
shale

Slope range: 1 to 3 percent

Elevation: 5,300 to 6,300 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Fordbutte very fine sandy loam, in an area of map
unit 215—Persayo-Fordbutte association, 1 to 10
percent slopes; San Juan County, New Mexico; about
8 miles north of Little Water; 2,500 feet west and 500
feet north of the southeast corner of sec. 23, T.27N.,
R.18W.; latitude 36 degrees 33 minutes 15 seconds
N and longitude 108 degrees 43 minutes 40 seconds
W.

A—0 to 4 inches; light yellowish brown (10YR 6/4)
very fine sandy loam, brown (10YR 4/3) moist;
moderate thick platy structure parting to
moderate very fine granular; soft, very friable,
slightly sticky and slightly plastic; few fine and
very fine roots; few very fine vesicular pores;
strongly effervescent; moderately alkaline; clear
smooth boundary.

Bw—4 to 14 inches; light yellowish brown (10YR 6/4)
loam, yellowish brown (10YR 5/4) moist;
moderate coarse subangular blocky structure;
slightly hard, friable, slightly sticky and slightly
plastic; few medium and common fine and very
fine roots; common very fine irregularly shaped
pores; strongly effervescent; strongly alkaline;
clear wavy boundary.

2Bk—14 to 20 inches; light yellowish brown (2.5Y
6/4) loam, light olive brown (2.5Y 5/4) moist;

moderate coarse subangular blocky structure;
hard, firm, slightly sticky and slightly plastic; few
medium and common fine and very fine roots;
common very fine continuous tubular pores; 2
percent fine pebbles; strongly effervescent,
secondary calcium carbonates segregated in few
fine irregularly shaped accumulations as
filaments and on undersides of rock fragments;
strongly alkaline; clear smooth boundary.

3BCk—20 to 26 inches; light yellowish brown (2.5Y
6/4) loam, light olive brown (2.5Y 5/4) moist;
weak coarse subangular blocky structure; hard,
firm, slightly sticky and slightly plastic; few
medium and fine and common very fine roots;
common very fine tubular pores; 5 percent soft
siltstone fragments; strongly effervescent,
secondary calcium carbonates segregated in
common fine irregularly shaped accumulations
as filaments and on undersides of rock
fragments; strongly alkaline; clear smooth
boundary.

4Cy—26 to 34 inches; light yellowish brown (2.5Y
6/4) loam, light olive brown (2.5Y 5/4) moist;
massive, platy rock structure; hard, firm, slightly
sticky and slightly plastic; few medium and very
fine roots; few very fine horizontal tubular pores;
50 percent soft siltstone fragments; secondary
fine sand-sized gypsum crystals segregated in
common fine irregularly shaped filaments and on
undersides of rock fragments; slightly
effervescent; moderately alkaline; clear smooth
boundary.

4Cr—34 inches; thinly interbedded siltstone and very
fine grained soft sandstone bedrock.

Range in Characteristics

Soil depth: 20 to 40 inches

*Silicate clay content, control section weighted
average:* 18 to 30 percent

*Rock fragment content, control section weighted
average:* 0 to 5 percent

Depth to base of cambic horizon: 10 to 16 inches

Reaction: ranges from moderately alkaline in the
surface to strongly alkaline in the subsoil and
substratum

A horizon:

Value: 4 or 5 moist

Chroma: 4 or 5

Bw horizon:

Value: 4 or 5 moist

Chroma: 4 or 5

Texture: loam, silt loam, or silty clay loam

Salinity, mmhos/cm: 2 to 4

Sodicity, SAR: 5 to 30

Bk and Bck horizons:

Hue: 10YR or 2.5Y

Value: 5 through 7 dry, 4 or 5 moist

Chroma: 2 through 4

Texture: loam, silt loam, or silty clay loam

Salinity, mmhos/cm: 2 to 4

Sodicity, SAR: 5 to 30

Calcium carbonate equivalent: 15 to 20 percent

Other features: 0 to 5 percent soft siltstone fragments

Cy horizon:

Value: 5 through 7

Chroma: 2 through 4

Texture: loam, silt loam, or silty clay loam

Salinity, mmhos/cm: 4 to 8

Sodicity, SAR: 5 to 13

Calcium carbonate equivalent: 15 to 20 percent

Gypsum content: 1 to 3 percent

Other features: 5 to 65 percent soft siltstone fragments

Fruitland Series

Classification: Coarse-loamy, mixed (calcareous), mesic Typic Torriorthents

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Fan terraces

Parent material: Alluvium derived from sandstone and siltstone

Slope range: 1 to 3 percent

Elevation: 4,700 to 5,100 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Fruitland sandy clay loam, in an area of map unit 270—Fruitland sandy clay loam, 1 to 3 percent slopes; San Juan County, New Mexico; about 6 miles east of Shiprock; 300 feet west and 2,000 feet south of the northeast corner of sec. 6, T.29N., R.16W.; latitude 36 degrees 45 minutes 30 seconds N and longitude 108 degrees 33 minutes 57 seconds W.

Ap—0 to 7 inches; yellowish brown (10YR 5/4) sandy clay loam, dark yellowish brown (10YR 4/4) moist; weak thin platy structure parting to moderate medium granular; slightly hard, friable,

slightly sticky and slightly plastic; few medium and very fine and common fine roots; few fine irregularly shaped pores; strongly effervescent; mildly alkaline; clear wavy boundary.

C1—7 to 13 inches; yellowish brown (10YR 5/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky and nonplastic; few coarse, medium, and very fine, and common fine roots; few fine irregularly shaped pores; strongly effervescent; mildly alkaline; clear wavy boundary.

C2—13 to 22 inches; light yellowish brown (10YR 6/4) fine sandy loam, yellowish brown (10YR 5/4) moist; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few coarse to very fine roots; few fine tubular pores; strongly effervescent; moderately alkaline; clear smooth boundary.

C3—22 to 36 inches; light yellowish brown (10YR 6/4) fine sandy loam, yellowish brown (10YR 5/4) moist; weak medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few medium and fine roots; few fine tubular pores; strongly effervescent; moderately alkaline; clear wavy boundary.

C4—36 to 42 inches; light yellowish brown (10YR 6/4) fine sandy loam, yellowish brown (10YR 5/4) moist; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few fine and medium roots; few fine tubular pores; strongly effervescent; moderately alkaline; clear wavy boundary.

C5—42 to 65 inches; light yellowish brown (10YR 6/4) sandy clay loam, yellowish brown (10YR 5/4) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few medium and fine roots; strongly effervescent; mildly alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 10 to 18 percent

Reaction: ranges from mildly alkaline to moderately alkaline

Ap horizon:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

C horizons:*Value:* 5 or 6 dry, 4 or 5 moist*Chroma:* 3 or 4*Texture:* fine sandy loam or sandy loam above 40 inches; sandy clay loam occurs below 40 inches*Salinity, mmhos/cm:* 2 to 4*Gypsum content:* 0 to 1 percent**Genats Series***Classification:* Fine, mixed, nonacid, mesic Typic Torriorthents*Depth class:* Moderately deep*Drainage class:* Well drained*Permeability:* Slow*Landform:* Footslopes and backslopes of plateaus, mesas, structural benches, and escarpments*Parent material:* Alluvium and residuum derived from shale*Slope range:* 15 to 60 percent*Elevation:* 5,300 to 6,000 feet*Mean annual precipitation:* 5 to 8 inches*Mean annual air temperature:* 51 to 54 degrees F.*Frost-free period:* 140 to 160 days**Typical Pedon**

Genats channery loamy fine sand, in an area of map unit 110—Brimhall-Benally-Genats association, 0 to 45 percent slopes; San Juan County, New Mexico; about 6.5 miles northeast of Sheep Springs; 1,000 feet south and 2,340 feet west of the northeast corner of sec. 1, T.22N., R.17W.; latitude 36 degrees 10 minutes 29 seconds N and longitude 108 degrees 36 minutes 11 seconds W.

A—0 to 4 inches; light brown (7.5YR 6/4) channery loamy fine sand, brown (7.5YR 5/4) moist; weak thin platy structure parting to weak fine granular; soft, very friable, nonsticky and nonplastic; few fine and very fine roots; few fine and very fine irregularly shaped pores; 15 percent channers and 5 percent flagstones; slightly effervescent; mildly alkaline; clear smooth boundary.

2Bw—4 to 8 inches; light brownish gray (10YR 6/2) clay, dark grayish brown (10YR 4/2) moist; moderate coarse subangular blocky structure; slightly hard, friable, sticky and plastic; few medium and fine and common very fine roots; few very fine irregularly shaped pores; 5 percent channers; slightly effervescent; strongly alkaline; clear smooth boundary.

2Cy1—8 to 13 inches; light brownish gray (10YR 6/2) silty clay, light brownish gray (10YR 6/2) moist; massive, platy rock structure; slightly hard, firm,

sticky and plastic; few medium and fine and common very fine roots; few very fine irregularly shaped pores; 35 percent soft shale fragments; 5 percent channers; secondary silt-sized gypsum crystals segregated in many fine and very fine irregularly shaped accumulations in seams and on rock fragments, primary sand-sized gypsum crystals as few fine masses; mildly alkaline; clear wavy boundary.

2Cy2—13 to 21 inches; light yellowish brown (10YR 6/4) silty clay, brown (10YR 4/3) moist; massive, platy rock structure; slightly hard, firm, sticky and plastic; few fine and very fine roots; few very fine irregularly shaped pores; 60 percent soft shale fragments; 5 percent channers; secondary silt-sized gypsum crystals segregated as few fine irregularly shaped accumulations in seams and on rock fragments, primary gypsum crystals as few fine masses; neutral; clear smooth boundary.

2C—21 to 27 inches; pinkish gray (7.5YR 6/2) silty clay, brown (7.5YR 5/2) moist; massive, platy rock structure; hard, firm, sticky and plastic; few medium and fine roots; 80 percent soft shale fragments; 5 percent channers; sand-sized primary gypsum crystals as very few fine masses; neutral; abrupt wavy boundary.

2Cr—27 inches; shale bedrock.

Range in Characteristics*Soil depth:* 20 to 40 inches*Silicate clay content, control section weighted average:* 35 to 55 percent*Reaction:* ranges from strongly alkaline in the subsoil to slightly acid in the underlying horizons**A horizon:***Hue:* 7.5YR or 10YR*Value:* 5 or 6 dry, 4 or 5 moist*Chroma:* 3 or 4*Texture:* channery loamy fine sand or channery silt loam

Rock fragments: total range is 15 to 35 percent; 15 to 25 percent channers, 0 to 10 percent flagstones, 0 to 3 percent stones and boulders

Bw horizon:*Hue:* 7.5YR or 10YR*Value:* 5 or 6 dry, 4 or 5 moist*Texture:* clay, silty clay, or silty clay loam*Rock fragments:* 5 to 15 percent channers*Salinity, mmhos/cm:* 4 to 8*Sodicity, SAR:* 13 to 30

Cy horizons:*Hue:* 7.5YR or 10YR*Value:* 4 through 6 dry, 3 through 5 moist*Chroma:* 2 through 4*Texture:* silty clay or silty clay loam*Rock fragments:* 5 to 15 percent channers*Salinity, mmhos/cm:* 4 to 8*Sodicity, SAR:* 13 to 30*Gypsum content:* 1 to 5 percent*Other features:* 15 to 60 percent soft shale fragments**C horizon:***Hue:* 7.5YR or 10YR*Value:* 4 through 6 dry, 3 through 5 moist*Chroma:* 2 through 4*Texture:* silty clay or silty clay loam*Rock fragments:* 0 to 5 percent channers*Salinity, mmhos/cm:* 8 to 16*Sodicity, SAR:* 13 to 30*Gypsum content:* 1 to 3 percent*Other features:* 50 to 80 percent soft shale fragments**Gotho Series***Classification:* Fine-loamy, mixed, (calcareous),
mesic Typic Torriorthents*Depth class:* Very deep*Drainage class:* Well drained*Permeability:* Moderately slow*Landform:* Low stream terraces*Parent material:* Alluvium derived from sandstone,
siltstone, and shale*Slope range:* 0 to 2 percent*Elevation:* 4,800 to 5,300 feet*Mean annual precipitation:* 6 to 8 inches*Mean annual air temperature:* 52 to 54 degrees F.*Frost-free period:* 140 to 160 days**Typical Pedon**

Gotho fine sandy loam, in an area of map unit 512—
Gotho fine sandy loam, 0 to 2 percent slopes; Apache
County, Arizona; about 4 miles northwest of Red
Mesa School; 2,150 feet west and 1,050 feet north of
the southeast corner of sec. 34, T.42N., R.27E.;
latitude 36 degrees 59 minutes 55 seconds N and
longitude 109 degrees 26 minutes 3 seconds W.

A—0 to 2 inches; red (2.5YR 5/6) fine sandy loam,
red (2.5YR 4/6) moist; weak thick platy structure;
soft, very friable, slightly sticky and nonplastic;
few very fine roots; few very fine irregularly
shaped pores; strongly effervescent; strongly
alkaline; abrupt smooth boundary.

AB—2 to 5 inches; red (2.5YR 4/6) clay loam, dark
red (2.5YR 3/6) moist; moderate very thick platy

structure; slightly hard, friable, sticky and plastic;
few very fine roots; few fine and very fine
irregularly shaped pores; strongly effervescent;
strongly alkaline; abrupt smooth boundary.

BC1—5 to 13 inches; red (2.5YR 5/6) sandy clay
loam, red (2.5YR 4/6) moist; moderate coarse
subangular blocky structure parting to weak thick
platy; slightly hard, friable, slightly sticky and
slightly plastic; few fine and common very fine
roots; few fine and very fine tubular pores; one
thin lense of loamy fine sand; slightly
effervescent; strongly alkaline; abrupt wavy
boundary.

BC2—13 to 22 inches; red (2.5YR 5/6) clay loam, red
(2.5YR 4/6) moist; moderate coarse subangular
blocky structure parting to weak very thick platy;
hard, firm, sticky and plastic; few medium and
fine, and common very fine roots; few fine and
common very fine tubular pores; strongly
effervescent, secondary calcium carbonates
segregated as very few fine irregularly shaped
accumulations on faces of peds; strongly
alkaline; clear wavy boundary.

C1—22 to 28 inches; red (2.5YR 5/6) sandy clay
loam, red (2.5YR 4/6) moist; weak coarse
subangular blocky structure; slightly hard, friable,
slightly sticky and slightly plastic; few fine and
very fine roots; few fine and common very fine
tubular pores; secondary gypsum crystals
segregated as very few fine irregularly shaped
accumulations on faces of peds; strongly
effervescent, secondary calcium carbonates
segregated as very few fine irregularly shaped
accumulations on faces of peds; strongly
alkaline; clear wavy boundary.

C2—28 to 36 inches; red (2.5YR 5/6) fine sandy
loam, red (2.5YR 4/6) moist; massive; soft, very
friable, nonsticky and nonplastic; few fine and
very fine roots; few fine and very fine tubular
pores; secondary gypsum crystals segregated
as very few fine irregularly shaped
accumulations on faces of peds; slightly
effervescent, secondary calcium carbonates
segregated as very few fine irregularly shaped
accumulations on faces of peds; strongly
alkaline; clear smooth boundary.

C3—36 to 57 inches; red (2.5YR 5/6) sandy clay
loam, red (2.5YR 4/6) moist; weak coarse
subangular blocky structure; hard, friable, slightly
sticky and slightly plastic; few very fine roots;
few fine and very fine tubular pores; strongly
effervescent, secondary calcium carbonates

segregated as very few fine irregularly shaped accumulations on faces of peds; strongly alkaline; clear smooth boundary.

C4—57 to 66 inches; reddish brown (2.5YR 5/4) clay loam, reddish brown (2.5YR 4/4) moist; moderate coarse subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; few fine and very fine tubular pores; secondary gypsum crystals segregated as very few fine irregularly shaped accumulations on faces of peds; strongly effervescent; strongly alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 18 to 35 percent

A horizon:

Hue: 2.5YR or 5YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 2 through 6

BC1 horizon:

Hue: 2.5YR or 5YR

Value: 5 or 6 dry, 3 through 5 moist

Chroma: 2 through 6

Texture: clay loam or sandy clay loam

Salinity, mmhos/cm: 0 to 2

Sodicity, SAR: 13 to 30

BC2 and C horizons:

Hue: 2.5YR or 5YR

Value: 5 or 6 dry, 3 through 5 moist

Chroma: 2 through 6

Texture: stratified fine sandy loam to clay loam

Salinity, mmhos/cm: 4 to 8

Sodicity, SAR: 13 to 30

Gypsum content: 0 to 1 percent

Other features: thin lenses and strata of loamy sand or loamy fine sand are present

Grazane Series

Classification: Fine-loamy, mixed, mesic Typic Haplargids

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Moderately slow

Landform: Risers of fan terraces and high stream terraces

Parent material: Alluvium derived from quartz diorite and residuum derived from sandstone and shale

Slope range: 20 to 50 percent

Elevation: 4,900 to 5,500 feet

Mean annual precipitation: 6 to 8 inches

Mean annual air temperature: 52 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Grazane very cobbly fine sandy loam, very stony, in an area of map unit 506—Blackston-Grazane association, 3 to 50 percent slopes; Apache County, Arizona; about 4 miles northwest of Teec Nos Pos; 2,325 feet east and 250 feet south of the northwest corner of sec. 20, T.41N., R.30W.; latitude 36 degrees 57 minutes 6 seconds N and longitude 109 degrees 8 minutes 54 seconds W.

A—0 to 2 inches; reddish brown (5YR 5/4) very cobbly fine sandy loam, reddish brown (5YR 4/4) moist; moderate medium platy structure parting to weak medium granular; soft, very friable, slightly sticky and nonplastic; few fine and many very fine roots; common fine irregularly shaped and tubular pores; 30 percent cobbles, 20 percent pebbles, and 1 percent stones; strongly effervescent; moderately alkaline; abrupt smooth boundary.

BA—2 to 6 inches; reddish brown (5YR 5/4) gravelly fine sandy loam, reddish brown (5YR 4/4) moist; weak coarse subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few medium and common fine and very fine roots; few very fine irregularly shaped pores; 15 percent pebbles and 5 percent cobbles; strongly effervescent; moderately alkaline; clear smooth boundary.

Btk1—6 to 10 inches; reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4) moist; weak coarse prismatic structure parting to moderate coarse subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few medium and fine and common very fine roots; common very fine and few fine tubular pores; few thin clay films on faces of peds and lining pores; 5 percent pebbles; violently effervescent, secondary calcium carbonates segregated in few fine irregularly shaped accumulations on rock fragments and on faces of peds; strongly alkaline; clear smooth boundary.

Btk2—10 to 16 inches; reddish brown (5YR 4/3) clay loam, dark reddish brown (5YR 3/3) moist; moderate coarse prismatic structure parting to moderate coarse subangular blocky; hard, firm, sticky and slightly plastic; common very fine and few fine roots; common fine and few very fine tubular pores; many thin clay films on faces of

pedes and lining pores; 5 percent pebbles; violently effervescent, secondary calcium carbonates segregated in few fine and medium irregularly shaped accumulations on rock fragments and on faces of pedes; strongly alkaline; abrupt smooth boundary.

2Btk3—16 to 20 inches; light reddish brown (5YR 6/4) clay loam, reddish brown (5YR 5/4) moist; moderate fine subangular blocky structure; very hard, firm, sticky and slightly plastic; common very fine and few fine roots; common fine and few very fine tubular pores; common thin clay films on faces of pedes and lining pores; 15 percent soft fragments; violently effervescent, secondary calcium carbonates segregated in few fine and medium irregularly shaped accumulations on rock fragments and on faces of pedes; strongly alkaline; clear smooth boundary.

2C—20 to 26 inches; reddish brown (5YR 5/3) clay loam, reddish brown (5YR 4/4) moist; massive; very hard, firm, sticky and slightly plastic; common very fine and few fine roots; 60 percent soft fragments; strongly effervescent; strongly alkaline; clear smooth boundary.

2Cr—26 inches; shale bedrock.

Range in Characteristics

Soil depth: 20 to 40 inches

Silicate clay content, control section weighted average: 27 to 35 percent

Depth to base of argillic horizon: 10 to 30 inches

Reaction: ranges from moderately alkaline in the surface and subsurface to strongly alkaline in the subsoil and substratum

A horizon:

Hue: 5YR or 7.5YR

Value: 4 through 6 dry, 3 through 5 moist

Chroma: 4 through 6

Rock fragments: total range is 35 to 60 percent; 10 to 20 percent pebbles, 25 to 35 percent cobbles, 0 to 5 percent stones

BA horizon:

Hue: 5YR or 7.5YR

Chroma: 4 through 6

Rock fragments: total range is 15 to 35 percent; 10 to 20 percent pebbles, 5 to 10 percent cobbles, 0 to 5 percent stones

Btk horizons:

Value: 4 through 6 dry, 3 through 5 moist

Chroma: 3 through 6

Texture: sandy clay loam or clay loam

Salinity, mmhos/cm: 2 to 4

Sodicity, SAR: 5 to 13

Calcium carbonate equivalent: 10 to 15 percent

Other features: 0 to 20 percent soft shale or sandstone fragments

C horizon:

Hue: 5GY through 7.5YR

Value: 4 through 6 dry, 3 through 5 moist

Chroma: 2 through 4

Texture: clay loam or sandy clay loam

Salinity, mmhos/cm: 4 to 8

Sodicity, SAR: 5 to 13

Calcium carbonate equivalent: 5 to 10 percent

Other features: 0 to 60 percent soft shale or sandstone fragments; some pedons have minor amounts of secondary gypsum

Green River Series

Classification: Coarse-loamy, mixed (calcareous), mesic Oxyaquic Torrifluvents

Depth class: Very deep

Drainage class: Moderately well drained

Permeability: Moderate

Landform: High flood plains

Parent material: Alluvium derived from sandstone

Slope range: 0 to 1 percent

Elevation: 4,700 to 5,000 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Green River fine sandy loam, in an area of map unit 153—Green River-Green River, saline fine sandy loams, 0 to 1 percent slopes; San Juan County, New Mexico; within the town of Shiprock; 1,600 feet west and 2,500 feet south of the northeast corner of sec. 25, T.30N., R.18W.; latitude 36 degrees 47 minutes 7 seconds N and longitude 108 degrees 41 minutes 16 seconds W.

Ap—0 to 6 inches; grayish brown (10YR 5/2) fine sandy loam, dark brown (10YR 3/3) moist; moderate medium granular structure; soft, very friable, slightly sticky and nonplastic; few medium and fine, and common very fine roots; common fine and very fine irregularly shaped pores; moderate medium continuous tubular worm casts; few thin strata of brown (7.5YR 5/4) sandy loam; strongly effervescent; moderately alkaline; abrupt wavy boundary.

AC—6 to 10 inches; grayish brown (10YR 5/2) loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common medium, fine, and very fine roots; common fine and very fine tubular pores; many medium continuous tubular worm casts; slightly effervescent; moderately alkaline; clear wavy boundary.

C1—10 to 16 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; few fine faint dark yellowish brown (10YR 4/4) redox concentrations; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few medium and fine, and common very fine roots; common fine and very fine tubular pores; common medium continuous grayish brown (10YR 5/2) tubular worm casts; gypsum or sodium sulfate salts segregated in very few fine filaments; slightly effervescent; moderately alkaline; clear smooth boundary.

C2—16 to 34 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; few fine faint dark yellowish brown (10YR 4/4) redox concentrations; massive; soft, very friable, slightly sticky and nonplastic; few medium and fine, and common very fine roots; few fine and common very fine tubular pores; very few thin lenses of very dark gray (10YR 3/1) silt loam; gypsum or sodium sulfate salts segregated in very few fine filaments; strongly effervescent; moderately alkaline; clear wavy boundary.

C3—34 to 48 inches; pale brown (10YR 6/3) silt loam, dark grayish brown (10YR 4/2) moist; few common prominent strong brown (7.5YR 4/6) and common fine distinct yellowish brown (10YR 5/6) redox concentrations; common very coarse platy structure; slightly hard, friable, slightly sticky and slightly plastic; few medium and common fine and very fine roots; few fine and very fine tubular pores; few thin strata of very fine sandy loam; gypsum or sodium sulfate salts segregated in few fine filaments; strongly effervescent; moderately alkaline; clear smooth boundary.

C4—48 to 55 inches; pale brown (10YR 6/3) fine sandy loam, dark grayish brown (10YR 4/2) moist; few fine faint dark gray (10YR 4/1) redox depletions, and common fine distinct yellowish brown (10YR 5/6) redox concentrations; massive;

soft, very friable, slightly sticky and nonplastic; few fine and very fine roots; few fine and very fine tubular pores; very few thin strata of loamy fine sand and very fine sandy loam; gypsum or sodium sulfate salts segregated in very few fine filaments; slightly effervescent; moderately alkaline; abrupt smooth boundary.

C5—55 to 68 inches; pale brown (10YR 6/3) sand, brown (10YR 4/3) moist; few fine faint dark yellowish brown (10YR 4/4) redox concentrations; single grain; loose, nonsticky and nonplastic; few very fine and fine roots; very few thin lenses of fine sandy loam; 5 percent pebbles; slightly effervescent; moderately alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 14 to 18 percent

Reaction: ranges from moderately alkaline to strongly alkaline

Depth to seasonal high water table: 3.5 to 5.0 feet

A or Ap horizons:

Chroma: 2 or 3

Salinity, mmhos/cm: 2 to 4

Sodicity, SAR: 0 to 5

AC and upper C horizons:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 or 3

Texture: loam, and stratified fine sand to silt loam

Salinity, mmhos/cm: 2 to 20

Sodicity, SAR: 0 to 13

Gypsum content: 0 to 1 percent

Redoximorphic features: few to common, fine to medium, faint to prominent, brown, strong brown, yellowish brown, or dark yellowish brown redox concentrations

Other features: lenses, laminae, and thin strata of sandy loam, fine sandy loam, very fine sandy loam, or silt loam are present which may have dark gray, very dark gray, or dark grayish brown colors within 40 inches of the soil surface

Lower C horizons:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 or 3

Texture: stratified coarse sand to fine sandy loam

Rock fragments: 0 to 5 percent pebbles

Salinity, mmhos/cm: 2 to 8

Sodicity, SAR: 0 to 13

Redoximorphic features: few to common, fine to

medium, faint or distinct, brown, strong brown, yellowish brown, or dark yellowish brown redox concentrations

Gyptur Series

Classification: Fine-silty, mixed, mesic Cambic Gypsiorthids

Depth class: Deep and very deep

Drainage class: Well drained

Permeability: Moderately slow

Landform: Toeslopes of undulating plateaus, and dissected fan terraces

Parent material: Alluvium and residuum derived from siltstone and shale

Slope range: 0 to 15 percent

Elevation: 4,800 to 5,600 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Gyptur very fine sandy loam, in an area of map unit 113—Gyptur very fine sandy loam, 0 to 3 percent slopes, San Juan County, New Mexico; about 5.5 miles south of Shiprock; 2,350 feet south and 1,250 feet west of the northeast corner of sec. 24, T.29N., R.18W.; latitude 36 degrees 42 minutes 47 seconds N and longitude 108 degrees 41 minutes 11 seconds W.

A—0 to 2 inches; light yellowish brown (10YR 6/4) very fine sandy loam, yellowish brown (10YR 5/4) moist; strong very thick platy structure parting to moderate fine granular; soft, very friable, slightly sticky and nonplastic; few very fine vesicular pores; violently effervescent; moderately alkaline; abrupt smooth boundary.

2AB—2 to 5 inches; brown (10YR 5/3) silty clay loam, brown (10YR 4/3) moist; moderate thin platy structure parting to strong very fine granular; soft, very friable, sticky and plastic; few fine and very fine roots; few very fine vesicular pores; violently effervescent; moderately alkaline; abrupt smooth boundary.

3By—5 to 17 inches; light brownish gray (2.5Y 6/2) gypsiferous material which is an apparent loam, grayish brown (2.5Y 5/2) moist; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and common very fine roots; common very fine tubular pores; secondary silt-sized gypsum crystals segregated in common fine irregularly shaped filaments on faces of peds, few coarse

sand-sized primary gypsum crystals; slightly effervescent; mildly alkaline; clear smooth boundary.

3BCy—17 to 26 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; moderate coarse subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few fine and common very fine roots; few very fine tubular pores; secondary silt-sized gypsum crystals segregated in few fine irregularly shaped filaments, few coarse sand-sized primary gypsum crystals; slightly effervescent; moderately alkaline; clear wavy boundary.

3C—26 to 46 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; massive, platy rock structure; soft, very friable, slightly sticky and slightly plastic; few fine and very fine roots; few very fine irregularly shaped pores; 5 percent soft siltstone fragments; few coarse sand-sized primary gypsum crystals; slightly effervescent; moderately alkaline; clear smooth boundary.

3Cr—46 inches; siltstone bedrock.

Range in Characteristics

Soil depth: 40 to 60 inches or more

Silicate clay content, control section weighted average: 18 to 35 percent

Rock fragment content, control section weighted average: 0 to 5 percent pebbles

Depth to gypsic horizon: 2 to 7 inches

Reaction: ranges from mildly alkaline in the surface to strongly alkaline in the underlying horizons

A horizon:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

Texture: very fine sandy loam or loam

Salinity, mmhos/cm: 2 to 4

Sodicity, SAR: 0 to 5

AB or Bw horizon:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

Texture: silty clay loam or clay loam

Salinity, mmhos/cm: 2 to 4

Sodicity, SAR: 5 to 13

By horizon:

Hue: 10YR or 2.5Y

Value: 6 or 7 dry, 4 or 5 moist

Chroma: 2 through 4

Texture: gypsiferous material which is an apparent loam, silty clay loam, or silt loam

Salinity, mmhos/cm: 2 to 25

Sodicity, SAR: 5 to 30

Calcium carbonate equivalent: 5 to 15 percent

Gypsum content: 10 to 25 percent

BCy and C horizons:

Hue: 10YR or 2.5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 through 4

Texture: loam, clay loam, or silt loam

Salinity, mmhos/cm: 8 to 25

Sodicity, SAR: 13 to 50

Calcium carbonate equivalent: 5 to 15 percent

Gypsum content: 5 to 10 percent

Other features: 5 to 30 percent soft siltstone or shale fragments

Hamburn Series

Classification: Fine-loamy, mixed (calcareous), mesic Ustic Torrifluvents

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately slow

Landform: Flood plains

Parent material: Alluvium derived from sandstone and shale

Slope range: 0 to 1 percent

Elevation: 5,200 to 6,000 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Hamburn clay loam, in an area of map unit 105—Hamburn clay loam, 0 to 1 percent slopes; San Juan County, New Mexico; about 8.5 miles northeast of Sheep Springs; 3,250 feet north and 2,400 feet east from the southwest corner of sec. 19, T.22N., R.16W.; latitude 36 degrees 12 minutes 53 seconds N and longitude 108 degrees 35 minutes 12 seconds W.

A—0 to 3 inches; pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; moderate medium platy structure parting to weak fine granular; slightly hard, friable, sticky and plastic; few medium and fine roots; strongly effervescent; moderately alkaline; clear wavy boundary.

AC—3 to 9 inches; pale brown (10YR 6/3) sandy clay loam, yellowish brown (10YR 5/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few coarse and medium, and common fine and very fine roots; few thin strata of silty clay loam;

strongly effervescent; mildly alkaline; clear wavy boundary.

C—9 to 12 inches; pale brown (10YR 6/3) sandy clay loam, brown (10YR 4/3) moist; weak medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few medium and fine, and common very fine roots; few thin strata of silty clay loam; strongly effervescent; mildly alkaline; clear wavy boundary.

Cz—12 to 24 inches; brown (10YR 5/3) sandy clay loam, brown (10YR 4/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; hard, firm, sticky and plastic; few medium and fine and common very fine roots; few thin strata of sandy loam; salt crystals segregated in few fine irregularly shaped seams; strongly effervescent; strongly alkaline; gradual smooth boundary.

Bzb1—24 to 33 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; moderate coarse subangular blocky structure; hard, firm, sticky and plastic; few fine and common very fine roots; salt crystals segregated in common medium irregularly shaped seams and filaments; strongly effervescent; strongly alkaline; gradual smooth boundary.

Bzb2—33 to 40 inches; yellowish brown (10YR 5/4) clay loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few fine and common very fine roots; salt crystals segregated in common fine and medium irregularly shaped seams and filaments; slightly effervescent; strongly alkaline; clear wavy boundary.

Bzb3—40 to 52 inches; yellowish brown (10YR 5/4) clay loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few fine and common very fine roots; salt crystals segregated in common fine and medium irregularly shaped seams and filaments; slightly effervescent; strongly alkaline; clear wavy boundary.

Bzb4—52 to 70 inches; yellowish brown (10YR 5/4) silty clay loam, dark yellowish brown (10YR 4/4) moist; weak coarse and moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; few very fine roots; salt crystals segregated in common fine irregularly shaped seams and filaments; slightly effervescent; strongly alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 27 to 35 percent

Reaction: ranges from mildly alkaline in the surface to strongly alkaline in the underlying horizons

Other features: receives 2 to 5 additional inches of run-on moisture from summer flooding

A horizon:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

Salinity, mmhos/cm: 0 to 2

Sodicity, SAR: 0 to 5

AC horizon:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

Texture: sandy clay loam or sandy loam

Salinity, mmhos/cm: 2 to 4

Sodicity, SAR: 5 to 13

C and Cz horizons:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

Texture: sandy clay loam or clay loam

Salinity, mmhos/cm: 4 to 16

Sodicity, SAR: 13 to 30

Gypsum content: 0 to 1 percent

Other features: thin strata of sandy loam, fine sandy loam, or silty clay loam are present

Bzb horizons:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

Texture: clay loam or silty clay loam

Salinity, mmhos/cm: 4 to 25

Sodicity, SAR: 13 to 45

Gypsum content: 0 to 1 percent

Highdye Series

Classification: Clayey, mixed, mesic Lithic Haplustalfs

Depth class: Shallow

Drainage class: Well drained

Permeability: Slow

Landform: Dipslopes of cuestas

Parent material: Eolian material, alluvium, and residuum derived from shale and sandstone

Slope range: 5 to 20 percent

Elevation: 6,600 to 8,000 feet

Mean annual precipitation: 12 to 16 inches

Mean annual air temperature: 48 to 50 degrees F.

Frost-free period: 120 to 140 days

Typical Pedon

Highdye flaggy fine sandy loam, very bouldery, in an area of map unit 412—Highdye-Menefee association, 5 to 35 percent slopes; San Juan County, New Mexico; about 8 miles south-southwest of Sanostee; 700 feet west and 2,450 feet south of the northeast corner of sec. 14, T.24N., R.20W.; latitude 36 degrees 18 minutes 52 seconds N and longitude 108 degrees 56 minutes 14 seconds W.

Soil surface is covered by 1 inch of pinyon needles, twigs, and oak leaves; abrupt smooth boundary.

A—0 to 1 inch; brown (7.5YR 4/2) flaggy fine sandy loam, dark brown (7.5YR 3/2) moist; weak thick platy structure parting to weak medium granular; soft, very friable, slightly sticky and nonplastic; few fine and common very fine roots; few very fine vesicular pores; 15 percent flagstones, 5 percent channers, and 2 percent boulders; slightly acid; abrupt smooth boundary.

AB—1 to 4 inches; brown (7.5YR 5/4) flaggy fine sandy loam, dark brown (7.5YR 3/2) moist; weak coarse subangular blocky structure; soft, very friable, slightly sticky and nonplastic; common fine, and few coarse, medium, and very fine roots; common fine tubular pores; 10 percent flagstones and 5 percent channers; neutral; clear wavy boundary.

2Bt1—4 to 8 inches; brown (7.5YR 5/4) sandy clay, dark brown (7.5YR 4/4) moist; moderate coarse subangular blocky structure; hard, firm, sticky and plastic; few coarse and medium and common fine and very fine roots; common fine and few very fine tubular pores; common thin clay films on faces of peds and lining pores; neutral; clear smooth boundary.

2Bt2—8 to 13 inches; brown (7.5YR 5/4) sandy clay, dark brown (7.5YR 3/4) moist; moderate coarse subangular blocky structure; hard, firm, sticky and plastic; few medium and common fine and very fine roots; few fine and common very fine tubular pores; few moderately thick clay films on faces of peds, and common thin clay films on faces of peds and lining pores; 20 percent soft

sandstone fragments; 5 percent flagstones and 5 percent channers; neutral; clear smooth boundary.

2R—13 inches; sandstone bedrock.

Range in Characteristics

Soil depth: 10 to 20 inches

Silicate clay content, control section weighted average: 35 to 50 percent

Depth to base of argillic horizon: 10 to 20 inches

Reaction: ranges from slightly acid in the surface to neutral in the subsoil

A and AB horizons:

Hue: 5YR or 7.5YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 2 through 4

Rock fragments: total range is 15 to 30 percent; 5 to 10 percent pebbles, 10 to 20 percent flagstones, 1 to 3 percent boulders

2Bt horizons:

Hue: 5YR or 7.5YR

Value: 4 through 6 dry, 3 through 5 moist

Chroma: 3 through 6

Texture: sandy clay, clay loam, or clay

Rock fragments: total range is 0 to 10 percent; 0 to 5 percent channers, 0 to 5 percent flagstones

Other features: 0 to 15 percent soft sandstone fragments

Hoskay Series

Classification: Fine, mixed, mesic Vertic Natrargids

Depth class: Very deep

Drainage class: Well drained

Permeability: Slow

Landform: Treads of fan terraces

Parent material: Alluvium derived from shale, sandstone, and limestone

Slope range: 1 to 10 percent

Elevation: 4,800 to 5,100 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Hoskay channery loam, in an area of map unit 167—Hoskay-Patel-Badland complex, 1 to 25 percent slopes; San Juan County, New Mexico; about 18 miles northwest of Shiprock and one mile south of the Colorado-New Mexico state line; 2,150 feet east

and 100 feet north of the southwest corner of sec. 13, T.32N., R.20W.; latitude 36 degrees 58 minutes 50 seconds N and longitude 108 degrees 54 minutes 33 seconds W.

A—0 to 2 inches; light yellowish brown (10YR 6/4) channery loam, dark yellowish brown (10YR 4/4) moist; moderate thick platy structure parting to moderate very fine granular; soft, very friable, slightly sticky and slightly plastic; few fine and common very fine roots; common very fine discontinuous tubular pores; 15 percent channers and 5 percent pebbles; strongly effervescent; moderately alkaline; clear smooth boundary.

Btkn—2 to 6 inches; yellowish brown (10YR 5/4) clay loam, dark yellowish brown (10YR 4/4) moist; weak medium prismatic structure; hard, firm, sticky and plastic; few medium and fine and common very fine roots; common very fine continuous tubular pores and few planar voids; common thin clay films on faces of peds and lining pores; 5 percent pebbles; strongly effervescent, secondary calcium carbonates segregated in few fine irregularly shaped accumulations on faces of peds and on undersides of rock fragments; strongly alkaline; clear smooth boundary.

Btkyn—6 to 14 inches; light yellowish brown (10YR 6/4) clay, yellowish brown (10YR 5/4) moist; moderate medium prismatic structure parting to moderate coarse subangular blocky; hard, firm, sticky and plastic; common fine and very fine roots; few very fine continuous tubular pores and few planar voids; few thin clay films on faces of peds and lining pores; 5 percent channers and 5 percent pebbles; secondary fine sand-sized gypsum crystals segregated as few fine irregularly shaped accumulations on faces of peds and in pores; strongly effervescent, secondary calcium carbonates segregated as few fine irregularly shaped accumulations on faces of peds and on undersides of rock fragments; moderately alkaline; abrupt wavy boundary.

Byk1—14 to 21 inches; light gray (10YR 7/2) gypsiferous material which is an apparent clay loam, light yellowish brown (10YR 6/4) moist; moderate coarse subangular blocky structure; hard, firm, sticky and plastic; few fine and common very fine roots; few very fine continuous tubular pores; 10 percent soft sandstone fragments; 5 percent channers and 5 percent

pebbles; secondary fine sand-sized gypsum crystals segregated as many fine and medium irregularly shaped accumulations on faces of peds and in pores; strongly effervescent, secondary calcium carbonates segregated as few medium irregularly shaped accumulations on faces of peds and on rock fragments; mildly alkaline; clear smooth boundary.

Byk2—21 to 27 inches; pale brown (10YR 6/3) gypsiferous material which is an apparent clay loam, brown (10YR 5/3) moist; moderate coarse subangular blocky structure; slightly hard, friable, sticky and plastic; few fine and common very fine roots; few very fine continuous tubular pores; 15 percent soft sandstone fragments; 5 percent channers and 5 percent pebbles; secondary fine and medium sand-sized gypsum crystals segregated as common medium irregularly shaped accumulations on faces of peds and few accumulations in pores; slightly effervescent, secondary calcium carbonates segregated as few medium irregularly shaped accumulations on faces of peds and on rock fragments; mildly alkaline; clear wavy boundary.

Byk3—27 to 39 inches; pale brown (10YR 6/3) channery clay loam, brown (10YR 5/3) moist; weak coarse subangular blocky structure; hard, firm, sticky and plastic; few fine and common very fine roots; few very fine discontinuous tubular pores; 20 percent soft sandstone fragments; 10 percent channers and 10 percent pebbles; secondary medium sand-sized gypsum crystals segregated as few fine and medium irregularly shaped accumulations on faces of peds and on rock fragments; slightly effervescent, secondary calcium carbonates segregated as very few medium irregularly shaped accumulations on faces of peds and on rock fragments; moderately alkaline; abrupt irregular boundary.

BCss—39 to 65 inches; light yellowish brown (2.5Y 6/4) and gray (10YR 6/1) silty clay, yellowish brown (2.5Y 5/4) and gray (10YR 5/1) moist; weak very coarse subangular blocky structure; very hard, very firm, sticky and plastic; few very fine roots; few large krotovinas; 5 percent soft shale fragments; few slickensides; few 0.5 inch wide angled cracks; few coarse sand and fine pebble-sized primary gypsum (selenite) crystals

throughout matrix; slightly effervescent; moderately alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 35 to 50 percent

Rock fragments, control section weighted average: 0 to 10 percent

Depth to base of natric horizon and top of gypsic horizon: 10 to 25 inches

Reaction: ranges from mildly alkaline in the surface to strongly alkaline in the subsoil

A or E horizon:

Hue: 7.5YR or 10YR

Value: 4 or 5 moist

Chroma: 3 or 4

Rock fragments: total range is 15 to 25 percent;

10 to 15 percent channers,

5 to 10 percent pebbles

Salinity, mmhos/cm: 2 to 4

Sodicity, SAR: 0 to 5

Btkn horizon:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

Texture: clay loam or clay

Salinity, mmhos/cm: 2 to 4

Sodicity, SAR: 13 to 30

Calcium carbonate equivalent: 5 to 10 percent

Btkyn horizon:

Hue: 7.5YR or 10YR

Value: 4 or 5 moist

Chroma: 3 or 4

Texture: clay loam or clay

Salinity, mmhos/cm: 4 to 8

Sodicity, SAR: 13 to 30

Calcium carbonate equivalent: 5 to 10 percent

Gypsum content: 5 to 10 percent

Byk1 and Byk2 horizons:

Value: 6 to 8 dry, 5 or 6 moist

Chroma: 2 to 4

Texture: gypsiferous material which is an apparent clay loam, sandy clay loam, or loam

Rock fragments: total range is 5 to 15 percent;

5 to 10 percent channers,

0 to 5 percent pebbles

Salinity, mmhos/cm: 8 to 16

Sodicity, SAR: 5 to 30

Calcium carbonate equivalent: 5 to 10 percent

Gypsum content: 15 to 25 percent

Other features: 0 to 20 percent soft shale or sandstone fragments

Byk3 and BCss horizons:

Hue: 10YR or 2.5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 1 to 4

Texture: stratified channery sandy clay loam to silty clay

Rock fragments: total range is 0 to 20 percent;

0 to 10 percent channers,

0 to 10 percent pebbles

Salinity, mmhos/cm: 8 to 16

Sodicity, SAR: 5 to 30

Calcium carbonate equivalent: 5 to 10 percent

Gypsum content: 5 to 10 percent as small secondary crystals and larger primary selenite

Other features: 0 to 20 percent soft shale or sandstone fragments

Hozho Series

Classification: Mixed, mesic, shallow Typic Torripsamments

Depth class: Shallow

Drainage class: Excessively drained

Permeability: Rapid

Landform: Backslopes of escarpments

Parent material: Colluvium and residuum derived from sandstone

Slope range: 40 to 70 percent

Elevation: 6,500 to 8,000 feet

Mean annual precipitation: 12 to 16 inches

Mean annual air temperature: 48 to 50 degrees F.

Frost-free period: 120 to 140 days

Typical Pedon

Hozho cobbly sandy loam, extremely bouldery, in an area of map unit 413—Hozho-Quezcan-Rock outcrop complex, 35 to 70 percent slopes; San Juan County, New Mexico; about 7 miles west of Sanostee; 1,450 feet north and 1,150 feet east of the southwest corner of sec. 8, T.25N., R.20W.; latitude 36 degrees 24 minutes 44 seconds N and longitude 109 degrees 0 minutes 6 seconds W.

A—0 to 3 inches; reddish brown (5YR 5/4) cobbly sandy loam, reddish brown (5YR 4/4) moist; weak thick platy structure parting to moderate fine granular; soft, very friable, slightly sticky and nonplastic; few fine and few very fine roots; few very fine irregularly shaped pores; weakly

developed black cryptogam crust on soil surface; 10 percent cobbles, 10 percent pebbles, 2 percent stones and 3 percent boulders; slightly effervescent; mildly alkaline; clear smooth boundary.

AC—3 to 6 inches; reddish brown (5YR 5/4) sandy loam, reddish brown (5YR 4/4) moist; moderate medium granular structure; soft, very friable, slightly sticky and nonplastic; few fine and common very fine roots; few very fine irregularly shaped pores; 5 percent pebbles; slightly effervescent; moderately alkaline; abrupt wavy boundary.

2C—6 to 14 inches; pinkish gray (7.5YR 7/2) with very pale brown (10YR 7/4) loamy sand, light brown (7.5YR 6/4) with brownish yellow (10YR 6/6) moist; massive, platy rock structure; slightly hard, friable, nonsticky and nonplastic; few coarse to very fine roots; 70 percent soft sandstone fragments; very slightly effervescent; moderately alkaline; clear wavy boundary.

2Cr—14 inches; soft sandstone bedrock.

Range in Characteristics

Soil depth: 10 to 20 inches

Silicate clay content, control section weighted average: 2 to 8 percent

Reaction: ranges from mildly alkaline in the surface to moderately alkaline in the underlying horizons

A horizon:

Hue: 5YR through 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 through 6

Rock fragments: total range is 15 to 35 percent;

5 to 10 percent pebbles,

10 to 20 percent cobbles,

1 to 5 percent stones,

3 to 10 percent boulders

Other features: rock fragment content is variable and some pedons lack cobbly surfaces or have very cobbly surfaces; some pedons have hue of 2.5YR or 2.5Y

AC horizon:

Hue: 5YR through 10YR

Value: 5 through 7 dry, 4 through 6 moist

Chroma: 4 through 6

Texture: sandy loam or loamy sand

Rock fragments: total range is 5 to 10 percent pebbles

Other features: some pedons have hue of 2.5YR or 2.5Y

2C horizon:*Hue:* 7.5YR through 2.5Y*Value:* 6 or 7 dry, 4 through 6 moist*Chroma:* 2 through 6*Texture:* loamy fine sand, loamy sand, or sand*Other features:* 10 to 70 percent soft sandstone fragments; some pedons have few accumulations of secondary calcium carbonates in the upper part of this horizon; some pedons have hue of 5YR or 5Y**Huerfano Series***Classification:* Loamy, mixed, mesic, shallow Typic Natrargids*Depth class:* Shallow*Drainage class:* Well drained*Permeability:* Moderately slow*Landform:* Toeslopes and interdune areas of undulating plateaus and toeslopes of cuestras and knolls*Parent material:* Alluvium and residuum derived from shale and sandstone*Slope range:* 0 to 3 percent*Elevation:* 5,400 to 6,000 feet*Mean annual precipitation:* 5 to 8 inches*Mean annual air temperature:* 51 to 54 degrees F.*Frost-free period:* 140 to 160 days**Typical Pedon**

Huerfano sandy clay loam, in an area of map unit 145—Razito-Huerfano complex, 0 to 8 percent slopes; San Juan County, New Mexico; about 24 miles east-northeast of Sheep Springs; 2,000 feet west and 1,625 feet south of the northeast corner of sec. 13, T.23N., R.14W.; latitude 36 degrees 13 minutes 47 seconds N and longitude 108 degrees 16 minutes 40 seconds W.

A—0 to 1 inch; pale brown (10YR 6/3) sandy clay loam, brown (10YR 5/3) moist; weak medium platy structure parting to moderate very fine granular; soft, very friable, slightly sticky and slightly plastic; few very fine roots; few very fine vesicular pores; 5 percent siderite pebbles on soil surface; strongly effervescent; strongly alkaline; abrupt smooth boundary.

Btn/E—1 to 4 inches; brown (10YR 5/3) sandy clay loam, brown (10YR 4/3) moist; strong medium prismatic structure; hard, friable, sticky and plastic; few very fine roots; common very fine vertical tubular pores; upper 0.5 inch of the prisms have bleached sand grains; few thin clay

films on faces of peds and lining pores; 10 percent pebbles; strongly effervescent; strongly alkaline; clear smooth boundary.

Btkn—4 to 11 inches; brown (10YR 5/3) sandy clay loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate coarse subangular blocky; hard, friable, sticky and plastic; few medium and common fine and very fine roots; common very fine tubular pores; few thin clay films on faces of peds and lining pores; 5 percent pebbles; strongly effervescent, secondary calcium carbonates segregated as common fine irregularly shaped soft masses and filaments; strongly alkaline; clear wavy boundary.

2BCy—11 to 18 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; few medium and common fine and very fine roots; few very fine irregularly shaped pores; 30 percent soft shale fragments; 5 percent pebbles; secondary gypsum crystals segregated as common fine irregularly shaped soft masses and filaments; strongly effervescent; moderately alkaline; clear wavy boundary.

2Cr—18 inches; shale bedrock.

Range in Characteristics*Soil depth:* 10 to 20 inches*Silicate clay content, control section weighted average:* 27 to 35 percent*Reaction:* ranges from mildly alkaline in the surface to strongly alkaline in the subsoil**A horizon:***Value:* 4 or 5 moist*Chroma:* 3 or 4*Texture:* sandy clay loam or fine sandy loam**Btn/E and Btkn horizons:***Value:* 5 or 6 dry, 4 or 5 moist*Chroma:* 3 or 4*Texture:* sandy clay loam or clay loam*Salinity, mmhos/cm:* 4 to 8*Sodicity, SAR:* 30 to 60*Calcium carbonate equivalent:* 3 to 10 percent**BCy or BCKy horizons:***Hue:* 10YR or 2.5Y*Chroma:* 2 through 4*Salinity, mmhos/cm:* 8 to 16*Sodicity, SAR:* 13 to 30*Gypsum content:* 1 to 5 percent

Iwela Series

Classification: Fine-loamy, mixed, mesic Aridic Haplustalfs

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate in the subsoil and rapid in the lower substratum

Landform: Footslopes and backslopes of stable landslides

Parent material: Colluvium derived from sandstone and shale

Slope range: 10 to 40 percent

Elevation: 6,800 to 7,800 feet

Mean annual precipitation: 12 to 16 inches

Mean annual air temperature: 48 to 50 degrees F.

Frost-free period: 120 to 140 days

Typical Pedon

Iwela very cobbly fine sandy loam, extremely bouldery, in an area of map unit 407—Iwela-Nomrah-Vosburg complex, 1 to 40 percent slopes; San Juan County, New Mexico; about 6 miles southwest of Sheep Springs; 500 feet north and 2,450 feet east of the southwest corner of sec. 30, T.22N., R.18W.; latitude 36 degrees 6 minutes 21 seconds N and longitude 108 degrees 48 minutes 2 seconds W.

A—0 to 3 inches; dark brown (7.5YR 4/2) very cobbly fine sandy loam, dark brown (7.5YR 3/2) moist; moderate thick platy structure parting to moderate medium granular; soft, very friable, slightly sticky and nonplastic; common fine and very fine roots; few fine tubular and common very fine irregularly shaped pores; 30 percent cobbles, 10 percent pebbles, 7 percent boulders, and 5 percent stones; neutral; clear smooth boundary.

Bt1—3 to 9 inches; reddish brown (5YR 5/4) gravelly sandy clay loam, reddish brown (5YR 4/4) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; few medium and very fine, and common fine roots; common fine and few very fine tubular pores; common thin clay films on faces of peds and lining pores; 15 percent pebbles and 5 percent cobbles; neutral; clear wavy boundary.

Bt2—9 to 17 inches; brown (7.5YR 5/4) cobbly sandy clay loam, brown (7.5YR 4/4) moist; moderate coarse subangular blocky structure; hard, firm, sticky and plastic; common medium and few coarse, fine, and very fine roots; common fine tubular pores; few moderately thick clay films on faces of peds, and common thin clay films on

faces of peds and lining pores; 15 percent cobbles and 10 percent pebbles; neutral; clear wavy boundary.

Bt3—17 to 26 inches; light brown (7.5YR 6/4) cobbly sandy clay loam, brown (7.5YR 5/4) moist; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common medium and few fine and very fine roots; common fine tubular pores; few moderately thick clay films on faces of peds, and few thin clay films on faces of peds and lining pores; 15 percent cobbles, 5 percent pebbles, and 5 percent stones; neutral, abrupt wavy boundary.

2Btk—26 to 44 inches; very pale brown (10YR 7/4) very stony sandy loam, yellowish brown (10YR 6/4) moist; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few medium, fine, and very fine roots; few very fine tubular pores; few thin clay films on faces of peds and lining pores; 35 percent stones, 10 percent cobbles, 5 percent pebbles, and 5 percent boulders; strongly effervescent with some spots non-effervescent, secondary calcium carbonates segregated as few fine and medium irregularly shaped accumulations on faces of peds and on rock fragments; mildly alkaline; clear wavy boundary.

2BCk—44 to 64 inches; very pale brown (10YR 7/3) very stony loamy sand, light yellowish brown (10YR 6/4) moist; weak coarse subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; few fine and very fine roots; 30 percent stones, 10 percent cobbles, 10 percent boulders, and 5 percent pebbles; strongly effervescent with some spots non-effervescent, secondary calcium carbonates segregated as common fine and medium irregularly shaped accumulations on rock fragments; moderately alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 18 to 35 percent

Rock fragment content, control section weighted average: 15 to 30 percent

Depth to base of argillic horizon: 11 to 45 inches

Reaction: ranges from neutral in the surface to moderately alkaline in the substratum

A horizon:

Hue: 5YR or 7.5YR

Value: 4 or 5 dry

Chroma: 2 or 3

Rock fragments: total range is 35 to 60 percent;
10 to 15 percent pebbles,
20 to 30 percent cobbles,
0 to 5 percent stones,
5 to 10 percent boulders

Upper Bt horizons:

Hue: 5YR or 7.5YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 or 4

Rock fragments: total range is 15 to 35 percent;
10 to 20 percent pebbles,
5 to 10 percent cobbles,
0 to 5 percent stones

Lower Bt horizons:

Hue: 5YR or 7.5YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

Texture: cobbly sandy clay loam or cobbly fine sandy loam

Rock fragments: total range is 15 to 35 percent;
5 to 10 percent pebbles,
10 to 20 percent cobbles,
0 to 5 percent stones

2Btk horizon:

Hue: 5YR through 10YR

Value: 6 or 7 dry, 5 or 6 moist

Chroma: 2 through 4

Texture: very stony sandy loam or very stony fine sandy loam

Clay content: 8 to 18 percent

Rock fragments: total range is 35 to 60 percent;
5 to 10 percent pebbles,
5 to 10 percent cobbles,
25 to 35 percent stones,
0 to 5 percent boulders

Calcium carbonate equivalent: 1 to 5 percent

2BCK horizon:

Hue: 5YR through 10YR

Value: 6 through 8 dry, 5 through 7 moist

Chroma: 2 through 4

Texture: very stony loamy sand or very stony loamy fine sand

Clay content: 5 to 10 percent

Rock fragments: total range is 35 to 60 percent;
5 to 10 percent pebbles,
5 to 10 percent cobbles,
20 to 30 percent stones,
5 to 10 percent boulders

Calcium carbonate equivalent: 1 to 10 percent

Jeddito Series

Classification: Coarse-loamy, mixed (calcareous),
mesic Typic Torriorthents

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately slow

Landform: Low stream terraces

Parent material: Alluvium derived from sandstone and shale

Slope range: 0 to 3 percent

Elevation: 4,700 to 6,000 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Jeddito loamy fine sand, in an area of map unit 190—Jeddito loamy fine sand, 0 to 2 percent slopes; San Juan County, New Mexico; about 3 miles east of Two Grey Hills Trading Post; 3,050 feet west and 200 feet south of the northeast corner of sec. 15, T.23N., R.18W.; latitude 36 degrees 14 minutes 4 seconds N and longitude 108 degrees 44 minutes 52 seconds W.

A—0 to 5 inches; light brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 5/4) moist; moderate thin platy structure parting to weak fine granular; soft, very friable, nonsticky and nonplastic; few fine roots; slightly effervescent; moderately alkaline; clear wavy boundary.

C1—5 to 11 inches; brown (7.5YR 5/4) loamy sand, brown (7.5YR 4/4) moist; weak coarse subangular blocky structure parting to weak fine granular; soft, very friable, nonsticky and nonplastic; few fine roots; slightly effervescent; moderately alkaline; clear wavy boundary.

C2—11 to 16 inches; brown (7.5YR 5/4) loamy sand, brown (7.5YR 4/4) moist; weak coarse subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; few fine and very fine roots; slightly effervescent; mildly alkaline; clear smooth boundary.

C3—16 to 21 inches; brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; weak coarse subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; few very fine roots; few very fine tubular pores; few lenses of very fine

sandy loam; slightly effervescent; moderately alkaline; clear smooth boundary.

C4—21 to 27 inches; brown (7.5YR 5/4) sandy clay loam, brown (7.5YR 4/4) moist; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; few fine and very fine tubular pores; few thin strata of fine sandy loam; slightly effervescent; moderately alkaline; clear wavy boundary.

C5—27 to 33 inches; brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine tubular pores; few lamina of clay loam; slightly effervescent; moderately alkaline; gradual wavy boundary.

C6—33 to 42 inches; light brown (7.5YR 6/4) clay loam, brown (7.5YR 5/4) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few fine and very fine roots; few fine and very fine irregularly shaped pores; slightly effervescent; moderately alkaline; clear smooth boundary.

C7—42 to 70 inches; light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4) moist; weak medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; few very fine roots; few fine and very fine irregularly shaped pores; common thin strata of clay loam; slightly effervescent; mildly alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 8 to 18 percent

Reaction: ranges from mildly alkaline to strongly alkaline

A horizon:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

Upper C horizons:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

Texture: loamy sand, loamy fine sand, or loamy very fine sand

Salinity, mmhos/cm: 0 to 4

Sodicity, SAR: 0 to 13

Lower C horizons:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

Texture: stratified fine sand to silty clay loam

Salinity, mmhos/cm: 2 to 8

Sodicity, SAR: 5 to 13

Gypsum content: 0 to 2 percent

Other features: some pedons have thin strata or subhorizons with hue of 5YR

Kaito Series

Classification: Coarse-loamy, mixed, mesic Typic Calciorthids

Depth class: Deep

Drainage class: Well drained

Permeability: Moderately rapid

Landform: Alluvial cones of hills

Parent material: Alluvium and residuum derived from sandstone, siltstone, and conglomerate

Slope range: 30 to 50 percent

Elevation: 5,300 to 6,000 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 54 to 56 degrees F.

Frost-free period: 150 to 170 days

Typical Pedon

Kaito extremely gravelly fine sandy loam, extremely stony, in an area of map unit 516—Kaito-Claysprings complex, 30 to 65 percent slopes; Apache County, Arizona; about 6.5 miles west-southwest of Red Mesa Trading Post; 2,350 feet east and 150 feet south of the northwest corner of sec. 29, T.41N., R.27E.; latitude 36 degrees 56 minutes 15 seconds N and longitude 109 degrees 28 minutes 22 seconds W.

A—0 to 3 inches; reddish brown (5YR 5/4) extremely gravelly fine sandy loam, reddish brown (5YR 4/4) moist; weak thick platy structure parting to moderate coarse granular; soft, very friable, slightly sticky and nonplastic; few fine and few very fine roots; common fine irregularly shaped pores; 45 percent pebbles, 15 percent cobbles, 10 percent stones, and 5 percent boulders; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk1—3 to 10 inches; reddish brown (5YR 5/4) gravelly fine sandy loam, reddish brown (5YR 4/4) moist; weak coarse subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few medium, fine, and very fine roots; few very fine tubular pores; 25 percent pebbles, and 5 percent cobbles; violently effervescent, secondary calcium carbonates segregated as common fine irregularly shaped accumulations

on rock fragments; moderately alkaline; clear smooth boundary.

Bk2—10 to 24 inches; pink (5YR 7/4) very fine sandy loam, reddish brown (5YR 5/4) moist; moderate medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; few fine and very fine roots; few very fine tubular pores; 5 percent pebbles; violently effervescent, secondary calcium carbonates segregated as many medium and coarse irregularly shaped accumulations on faces of peds and on rock fragments; moderately alkaline; clear wavy boundary.

2Bk3—24 to 32 inches; light reddish brown (5YR 6/3) fine sandy loam, reddish brown (5YR 5/4) moist; moderate coarse subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few fine and very fine roots; few fine and very fine tubular pores; 5 percent soft sandstone fragments; violently effervescent, secondary calcium carbonates segregated as common medium and large irregularly shaped accumulations on faces of peds and on rock fragments; strongly alkaline; clear wavy boundary.

2Ck—32 to 47 inches; light reddish brown (5YR 6/3) fine sandy loam, reddish brown (5YR 5/4) moist; massive, platy rock structure; slightly hard, friable, slightly sticky and nonplastic; few fine and very fine roots; few very fine tubular pores; 25 percent soft sandstone and siltstone fragments; strongly effervescent, secondary calcium carbonates segregated as few fine and medium irregularly shaped accumulations in filaments and on rock fragments; strongly alkaline; clear wavy boundary.

2Cr—47 inches; soft sandstone bedrock.

Range in Characteristics

Soil depth: 40 to 60 inches

Silicate clay content, control section weighted average: 10 to 18 percent

Depth to calcic horizon: 3 to 10 inches

Reaction: ranges from moderately alkaline in the surface and upper substratum to strongly alkaline in the lower substratum

A horizon:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 through 6

Rock fragments: total range is 60 to 75 percent;

40 to 50 percent pebbles,
5 to 15 percent cobbles,
10 to 15 percent stones,
1 to 5 percent boulders

Bk1 horizon:

Value: 5 through 7 dry, 4 or 5 moist

Chroma: 4 through 6

Texture: gravelly fine sandy loam or gravelly very fine sandy loam

Rock fragments: total range is 15 to 30 percent;

10 to 20 percent pebbles,

5 to 10 percent cobbles

Calcium carbonate equivalent: 10 to 25 percent

Bk2 horizon:

Value: 7 or 8 dry, 5 through 7 moist

Chroma: 4 through 6

Texture: very fine sandy loam, fine sandy loam, or loam

Rock fragments: total range is 0 to 10 percent;

0 to 10 percent pebbles,

0 to 5 percent cobbles

Calcium carbonate equivalent: 25 to 50 percent

2Bk3 and Ck horizons:

Value: 6 or 7 dry, 4 or 5 moist

Chroma: 3 through 6

Calcium carbonate equivalent: 5 to 25 percent

Other features: 5 to 25 percent soft sandstone or siltstone fragments

Katzine Series

Classification: Loamy-skeletal, mixed, mesic

Calcicorthidic Ustochrepts

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately rapid

Landform: Risers of fan terraces

Parent material: Alluvium derived from quartz diorite and sandstone

Slope range: 15 to 45 percent

Elevation: 6,200 to 7,200 feet

Mean annual precipitation: 12 to 14 inches

Mean annual air temperature: 48 to 50 degrees F.

Frost-free period: 130 to 150 days

Typical Pedon

Katzine very cobbly very fine sandy loam, extremely stony, in an area of map unit 403—Chazner-Katzine complex, 5 to 45 percent slopes; Apache County, Arizona; about 8.5 miles south-southeast of Teec Nos Pos; 150 feet west and 1,520 feet south of the

northeast corner of sec. 7, T.39N., R.31E.; latitude 36 degrees 48 minutes 21 seconds N and longitude 109 degrees 3 minutes 3 seconds W.

A—0 to 1 inch; reddish brown (5YR 5/4) very cobbly very fine sandy loam, dark reddish brown (5YR 3/4) moist; weak medium platy structure parting to moderate medium granular; soft, very friable, slightly sticky and slightly plastic; common very fine and few fine roots; few fine irregularly shaped pores; 30 percent cobbles, 20 percent pebbles, and 5 percent stones; slightly effervescent; neutral; abrupt smooth boundary.

Bw—1 to 7 inches; reddish brown (5YR 5/4) very cobbly very fine sandy loam, dark reddish brown (5YR 3/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and few fine roots; common fine tubular pores; 25 percent cobbles and 20 percent pebbles; strongly effervescent; mildly alkaline; clear smooth boundary.

Bk1—7 to 12 inches; light brown (7.5YR 6/4) very cobbly fine sandy loam, brown (7.5YR 4/4) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; common medium and few fine roots; common fine tubular pores; 25 percent pebbles and 25 percent cobbles; violently effervescent, secondary calcium carbonates segregated as common medium irregularly shaped accumulations on rock fragments and weakly cemented concretions; moderately alkaline; gradual smooth boundary.

Bk2—12 to 28 inches; reddish yellow (7.5YR 7/6) very cobbly fine sandy loam, brown (7.5YR 5/4) moist; weak coarse subangular blocky structure; soft, very friable, slightly sticky and nonplastic; common very fine and few medium roots; common fine tubular pores; 25 percent cobbles, 20 percent pebbles, and 5 percent stones; violently effervescent, secondary calcium carbonates segregated as many large weakly cemented accumulations on rock fragments; moderately alkaline; clear smooth boundary.

Bk3—28 to 47 inches; pink (7.5YR 7/4) very cobbly sandy loam, brown (7.5YR 5/4) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; common very fine and few medium roots; common fine tubular pores; 30 percent cobbles, 20 percent

pebbles, and 5 percent stones; violently effervescent, secondary calcium carbonates segregated as common medium weakly cemented accumulations on rock fragments; moderately alkaline; clear smooth boundary.

2C—47 to 63 inches; light brown (7.5YR 6/4) extremely cobbly loamy sand, brown (7.5YR 4/4) moist; single grain; loose, nonsticky and nonplastic; common very fine and few fine roots; few fine and very fine tubular pores; 35 percent cobbles, 20 percent pebbles, and 15 percent stones; slightly effervescent; moderately alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 8 to 18 percent

Rock fragment content, control section weighted average: 35 to 60 percent

Depth to calcic horizon: 6 to 8 inches

Reaction: ranges from neutral in the surface to moderately alkaline in the substratum

A and Bw horizons:

Value: 4 through 6 dry, 3 or 4 moist

Chroma: 3 or 4

Rock fragments: total range is 35 to 60 percent; 10 to 20 percent pebbles, 25 to 35 percent cobbles, 0 to 5 percent stones

Bk horizons:

Hue: 5YR or 7.5YR

Value: 5 through 7 dry, 4 through 6 moist

Chroma: 3 through 6

Texture: very cobbly fine sandy loam or very cobbly sandy loam

Rock fragments: total range is 35 to 60 percent; 15 to 25 percent pebbles, 20 to 30 percent cobbles, 0 to 5 percent stones

Calcium carbonate equivalent: 15 to 25 percent

2C horizon:

Hue: 5YR or 7.5YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 through 6

Texture: extremely cobbly loamy sand or extremely cobbly sand

Rock fragments: total range is 60 to 90 percent; 20 to 30 percent pebbles, 35 to 45 percent cobbles, 5 to 15 percent stones

Calcium carbonate equivalent: 3 to 5 percent

Kimбето Series

Classification: Fine-loamy, mixed, mesic Haplic Natrargids

Depth class: Deep and very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Summits of plateaus and structural benches, dipslopes of cuestras, and treads of high stream terraces

Parent material: Eolian material, alluvium, and residuum derived dominantly from sandstone

Slope range: 0 to 5 percent

Elevation: 4,800 to 6,100 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Kimбето loamy fine sand, in an area of map unit 125—Kimбето loamy fine sand, 0 to 4 percent slopes; San Juan County, New Mexico; about 5 miles east of Newcomb; 1,450 feet north and 450 feet east of the southwest corner of sec. 25, T.24N., R.17W.; latitude 36 degrees 16 minutes 54 seconds N and longitude 108 degrees 36 minutes 38 seconds W.

A—0 to 3 inches; light brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 4/4) moist; weak medium platy structure parting to weak fine granular; soft, very friable, nonsticky and nonplastic; few medium and common fine and very fine roots; slightly effervescent; mildly alkaline; clear smooth boundary.

Bw—3 to 10 inches; light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 4/4) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; common fine and very fine roots; few very fine tubular pores; slightly effervescent; moderately alkaline; clear smooth boundary.

2Btkn—10 to 18 inches; brown (7.5YR 5/4) sandy clay loam, brown (7.5YR 4/4) moist; weak medium prismatic structure parting to moderate coarse subangular blocky; hard, firm, slightly sticky and plastic; few fine and very fine roots; few fine and common very fine tubular pores; few thin clay films on faces of peds and lining pores, and clay bridging sand grains; strongly effervescent, secondary calcium carbonates segregated in few fine rounded soft masses; very strongly alkaline; clear wavy boundary.

2Bkn1—18 to 22 inches; very pale brown (10YR 7/4)

fine sandy loam, yellowish brown (10YR 5/6) moist; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; few very fine tubular pores; violently effervescent, secondary calcium carbonates disseminated and also segregated in common medium irregularly shaped soft masses; strongly alkaline; clear smooth boundary.

3Bkn2—22 to 29 inches; white (10YR 8/2) fine sandy loam, very pale brown (10YR 7/4) moist; moderate coarse subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine and very fine roots; few very fine tubular pores; 10 percent soft sandstone fragments; 5 percent pebbles; violently effervescent, secondary calcium carbonates disseminated and also segregated as common fine and medium irregularly shaped soft masses and as accumulations on rock fragments; strongly alkaline; clear wavy boundary.

3BCkn—29 to 42 inches; brownish yellow (10YR 6/6) loamy fine sand, yellowish brown (10YR 5/6) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few fine and common very fine roots; 20 percent soft sandstone fragments; 5 percent channers; violently effervescent, secondary calcium carbonates disseminated and also segregated as few fine irregularly shaped accumulations on the undersides of rock fragments; strongly alkaline; clear smooth boundary.

3Cr—42 inches; soft sandstone bedrock.

Range in Characteristics

Soil depth: 40 to 60 inches or more

Silicate clay content, control section weighted average: 18 to 27 percent

Depth to base of natric horizon: 10 to 35 inches

Depth to calcic horizon: 10 to 31 inches

Reaction: ranges from mildly alkaline in the surface to very strongly alkaline in the subsoil

A horizon:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

Texture: loamy fine sand or fine sandy loam

Bw horizon:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

Texture: fine sandy loam or very fine sandy loam

Btkn horizon:*Hue:* 7.5YR or 10YR*Value:* 4 through 6 dry, 4 or 5 moist*Chroma:* 3 through 6*Texture:* sandy clay loam, fine sandy loam, or loam*Rock fragments:* 0 to 10 percent pebbles*Salinity, mmhos/cm:* 0 to 4*Sodicity, SAR:* 0 to 5*Calcium carbonate equivalent:* 5 to 10 percent**Bkn horizons:***Hue:* 7.5YR or 10YR*Value:* 6 through 8 dry, 4 through 6 moist*Chroma:* 2 through 6*Texture:* fine sandy loam or loam*Rock fragments:* 0 to 15 percent pebbles*Salinity, mmhos/cm:* 2 to 8*Sodicity, SAR:* 5 to 30*Calcium carbonate equivalent:* 10 to 30 percent*Other features:* 0 to 15 percent soft sandstone fragments**BCK or Ck horizon:***Hue:* 10YR or 2.5Y*Value:* 6 through 8 dry, 4 through 7 moist*Chroma:* 2 through 6*Texture:* loamy fine sand, fine sandy loam, or loam*Rock fragments:* 0 to 5 percent pebbles or small channers*Salinity, mmhos/cm:* 4 to 16*Sodicity, SAR:* 13 to 30*Calcium carbonate equivalent:* 5 to 15 percent*Gypsum content:* 0 to 5 percent*Other features:* 0 to 30 percent soft sandstone fragments; very deep phase has texture of cobbly sandy clay loam**Kimnoli Series***Classification:* Loamy, mixed, mesic Lithic Haplargids*Depth class:* Very shallow*Drainage class:* Well drained*Permeability:* Moderate*Landform:* Dipslopes of cuestras and summits of structural benches*Parent material:* Eolian material and alluvium derived from sandstone*Slope range:* 2 to 10 percent*Elevation:* 4,700 to 5,400 feet*Mean annual precipitation:* 6 to 8 inches*Mean annual air temperature:* 52 to 54 degrees F.*Frost-free period:* 140 to 160 days**Typical Pedon**

Kimnoli loamy fine sand, in an area of map unit 504—

Tohona-Kimnoli-Claysprings complex, 2 to 45 percent slopes; San Juan County, New Mexico; about 3 miles southeast of the Four Corners Monument; 700 feet north and 1,450 feet west of the southeast corner of sec. 24, T.32N., R.21W.; latitude 36 degrees 58 minutes 5 seconds N and longitude 109 degrees 1 minute 39 seconds W.

A—0 to 4 inches; light brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 5/4) moist; weak thick platy structure parting to single grain; loose, nonsticky and nonplastic; few fine and common very fine roots; few very fine vesicular pores; slightly effervescent; mildly alkaline; clear smooth boundary.

Btk—4 to 9 inches; light brown (7.5YR 6/4) fine sandy loam, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; few fine and common very fine roots; few very fine tubular pores; few thin clay films lining pores and bridging sand grains; 5 percent pebbles; strongly effervescent, secondary calcium carbonates segregated in few fine irregularly shaped accumulations on faces of peds and on undersides of rock fragments; moderately alkaline; abrupt smooth boundary.

2R—9 inches; sandstone bedrock.

Range in Characteristics*Soil depth:* 7 to 10 inches*Silicate clay content, control section weighted average:* 18 to 25 percent*Reaction:* ranges from mildly alkaline in the surface to moderately alkaline in the subsoil**Btk horizon:***Chroma:* 4 or 6*Texture:* fine sandy loam or sandy clay loam*Calcium carbonate equivalent:* 5 to 10 percent**Kinusta Series***Classification:* Loamy, mixed (calcareous), mesic, shallow Ustic Torriorthents*Depth class:* Shallow*Drainage class:* Well drained*Permeability:* Moderate*Landform:* Backslopes of escarpments*Parent material:* Alluvium, colluvium, and residuum derived from siltstone, mudstone, limestone, and sandstone*Slope range:* 15 to 60 percent*Elevation:* 5,200 to 6,600 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F.

Frost-free period: 130 to 150 days

Typical Pedon

Kinusta channery very fine sandy loam, in an area of map unit 311—Kinusta-Eslendo-Rock outcrop complex, 15 to 70 percent slopes; Apache County, Arizona; about 7 miles south of Immanuel Mission; 50 feet north and 950 feet east of the southwest corner of sec. 15, T.38N., R.29E.; latitude 36 degrees 41 minutes 37 seconds N and longitude 109 degrees 13 minutes 32 seconds W.

A—0 to 3 inches; red (2.5YR 5/6) channery very fine sandy loam, red (2.5YR 4/6) moist; weak very thick platy structure parting to moderate medium granular; soft, very friable, nonsticky and nonplastic; few very fine roots; few very fine vesicular pores; 15 percent channers and 10 percent flagstones; strongly effervescent; mildly alkaline; clear smooth boundary.

2Ck—3 to 9 inches; red (2.5YR 5/6) very fine sandy loam, red (2.5YR 4/6) moist; massive, platy rock structure; slightly hard, friable, slightly sticky and nonplastic; few coarse to very fine roots; 60 percent soft siltstone fragments; strongly effervescent, secondary calcium carbonates segregated as few fine and medium irregularly shaped accumulations on rock fragments; strongly alkaline; clear wavy boundary.

2C—9 to 17 inches; red (2.5YR 5/6) very fine sandy loam, red (2.5YR 4/6) moist; massive, platy rock structure; hard, firm, slightly sticky and nonplastic; few fine and very fine roots; 80 percent soft siltstone fragments; slightly effervescent, secondary calcium carbonates segregated as very few fine irregularly shaped accumulations on rock fragments; strongly alkaline; clear irregular boundary.

2Cr—17 inches; siltstone bedrock.

Range in Characteristics

Soil depth: 10 to 20 inches

Silicate clay content, control section weighted average: 12 to 18 percent

Reaction: ranges from mildly alkaline in the surface to strongly alkaline in the underlying horizons

A horizon:

Hue: 2.5YR or 5YR

Value: 5 or 6 dry

Chroma: 4 through 6

Texture: channery very fine sandy loam or very gravelly loam

Rock fragments: total range is 15 to 60 percent;

5 to 15 percent small channers,

5 to 30 percent pebbles,

5 to 12 percent cobbles and flagstones (less than 10 inches long),

0 to 3 percent stones or boulders

2Ck and 2C horizons:

Hue: 2.5YR or 5YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 through 6

Texture: very fine sandy loam or silt loam

Calcium carbonate equivalent: 5 to 10 percent

Other features: 20 to 80 percent soft siltstone or mudstone fragments

Kitsili Series

Classification: Coarse-loamy, mixed, mesic
Ustochreptic Camborthids

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately rapid

Landform: Fan terraces, and summits of mesas and plateaus

Parent material: Alluvium and eolian material derived from sandstone

Slope range: 1 to 8 percent

Elevation: 5,600 to 6,500 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F.

Frost-free period: 130 to 150 days

Typical Pedon

Kitsili fine sandy loam, in an area of map unit 306—Arches-Kitsili-Mido complex, 1 to 25 percent slopes; San Juan County, New Mexico; about 19 miles southwest of Shiprock; 550 feet north and 250 feet west of the southeast corner of sec. 17, T.28N., R.20W.; latitude 36 degrees 39 minutes 22 seconds N and longitude 108 degrees 59 minutes 21 seconds W.

A—0 to 3 inches; reddish brown (5YR 5/4) fine sandy loam, dark reddish brown (5YR 3/4) moist; weak medium platy structure parting to weak fine granular; soft, very friable, nonsticky and nonplastic; few fine and common very fine roots; few fine vesicular pores; slightly effervescent; mildly alkaline; clear smooth boundary.

AB—3 to 7 inches; reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) moist;

weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine and very fine roots; common fine vesicular pores; strongly effervescent; moderately alkaline; clear smooth boundary.

Bw—7 to 14 inches; reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) moist; moderate coarse subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; few fine and common very fine roots; few fine tubular pores; very few thin clay films bridging sand grains; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk1—14 to 30 inches; reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) moist; moderate coarse subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; common very fine roots; few fine and common very fine tubular pores; 2 percent pebbles; violently effervescent, secondary calcium carbonates segregated as few fine irregularly shaped accumulations on faces of peds and on rock fragments; moderately alkaline; clear wavy boundary.

Bk2—30 to 48 inches; reddish brown (5YR 5/4) very fine sandy loam, reddish brown (5YR 4/4) moist; moderate very coarse subangular blocky structure; hard, friable, slightly sticky and nonplastic; common very fine roots; few fine and common very fine tubular pores; 2 percent pebbles; violently effervescent, secondary calcium carbonates segregated as few fine irregularly shaped accumulations on faces of peds and on rock fragments; moderately alkaline; clear wavy boundary.

BC—48 to 64 inches; reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) moist; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common very fine roots; few fine and common very fine tubular pores; strongly effervescent, secondary calcium carbonates segregated as very few fine irregularly shaped accumulations on faces of peds; moderately alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 10 to 18 percent

Depth to top of cambic horizon: 7 to 10 inches

Reaction: ranges from mildly alkaline in the surface to moderately alkaline in the subsoil and substratum

A horizon:

Value: 5 or 6 dry, 3 through 5 moist

Chroma: 4 through 6

Texture: fine sandy loam or loamy fine sand

AB horizon:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 through 6

Texture: fine sandy loam or loamy fine sand

Bw horizon:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 through 6

Texture: fine sandy loam or very fine sandy loam

Bk horizon:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 through 6

Texture: fine sandy loam or very fine sandy loam

Calcium carbonate equivalent: 3 to 5 percent

BC horizon:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 through 6

Texture: fine sandy loam or very fine sandy loam

Calcium carbonate equivalent: 3 to 5 percent

Klizhin Series

Classification: Coarse-loamy, mixed Pachic Haploborolls

Depth class: Deep and very deep

Drainage class: Well drained

Permeability: Moderately rapid

Landform: Footslopes of high plateaus, mesas, and structural benches

Parent material: Alluvium and residuum derived from sandstone

Slope range: 10 to 35 percent

Elevation: 8,500 to 9,200 feet

Mean annual precipitation: 20 to 24 inches

Mean annual air temperature: 39 to 42 degrees F.

Frost-free period: 70 to 100 days

Typical Pedon

Klizhin fine sandy loam, in an area of map unit 704—Klizhin-Captom complex, 15 to 60 percent slopes, San Juan County, New Mexico; about 6.5 miles south-southwest of Toadlena; 2,100 feet east and 1,125 feet south of the northwest corner of sec. 11, T.22N., R.20W.; latitude 36 degrees 9 minutes 33 seconds N and longitude 108 degrees 56 minutes 43 seconds W.

Soil surface is covered by 2 inches of pine needles, cones, and twigs; abrupt smooth boundary.

A—0 to 4 inches; dark gray (10YR 4/1) fine sandy loam, black (10YR 2/1) moist; moderate very coarse platy structure parting to weak medium granular; soft, very friable, slightly sticky and nonplastic; common very fine and few medium roots; common very fine and few fine tubular pores; neutral; clear smooth boundary.

AB—4 to 17 inches; very dark gray (10YR 3/1) fine sandy loam, black (10YR 2/1) moist; weak coarse subangular blocky structure; soft, very friable, slightly sticky and nonplastic; common very fine and few coarse roots; common very fine and few fine tubular pores; 5 percent pebbles; neutral; gradual smooth boundary.

Bw1—17 to 31 inches; dark gray (10YR 4/1) fine sandy loam; black (10YR 2/1) moist; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common very fine and few coarse roots; common very fine and few fine tubular pores; 5 percent channers; neutral; clear wavy boundary.

Bw2—31 to 49 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 2/2) moist; weak coarse parting to moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common very fine and few coarse roots; many very fine and few fine tubular pores; 10 percent channers; neutral; clear wavy boundary.

E/Btb—49 to 56 inches; pinkish gray (7.5YR 6/2) loamy sand; brown (7.5YR 4/4) moist; weak coarse subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; few very fine and fine roots; few very fine and fine irregularly shaped pores; common bleached sand grains (skeletons) on faces of peds; very few thin clay films on rock fragments and bridging sand grains; 5 percent pebbles and 5 percent channers; slightly acid; abrupt smooth boundary.

Btb—56 to 64 inches; light brown (7.5YR 6/4) sandy loam; brown (7.5YR 4/4) moist; moderate coarse subangular blocky structure; hard, firm, slightly sticky and nonplastic; few very fine roots; common very fine tubular and irregularly shaped pores; few thin clay films on faces of peds and lining pores; 5 percent channers; slightly acid.

Range in Characteristics

Soil depth: 40 to 60 inches or more

Silicate clay content, control section weighted average: 8 to 18 percent

Rock fragment content, control section weighted average: 0 to 10 percent pebbles or small channers

Depth to base of mollic epipedon: 18 to 35 inches

Reaction: ranges from slightly acid to neutral

A and AB horizons:

Value: 3 or 4 dry, 2 or 3 moist

Chroma: 1 or 2

Bw horizons:

Hue: 7.5YR or 10YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 1 through 3

E/Btb and Btb horizons:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 through 6

Texture: sandy loam, fine sandy loam, or loamy sand

Kunz Series

Classification: Fine-loamy, mixed Mollic Eutroboralfs

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate or moderately slow

Landform: Knolls, footslopes, and backslopes of stable landslides

Parent material: Colluvium and alluvium derived from sandstone, shale, and basalt

Slope range: 5 to 45 percent

Elevation: 7,500 to 8,600

Mean annual precipitation: 16 to 20 inches

Mean annual air temperature: 42 to 45 degrees F.

Frost-free period: 90 to 120 days

Typical Pedon

Kunz very flaggy fine sandy loam, extremely bouldery, in an area of map unit 600—Kunz-Yahmore complex, 2 to 35 percent slopes; San Juan County, New Mexico; about 7 miles west-southwest of Sheep Springs; 350 feet north and 250 feet west of the southeast corner of sec. 23, T.22N., R.19W.; latitude 36 degrees 7 minutes 11 seconds N and longitude 108 degrees 49 minutes 39 seconds W.

Soil surface is covered by 1 inch of pine needles, twigs, and cones; abrupt smooth boundary.

A—0 to 4 inches; dark brown (7.5YR 4/2) very flaggy fine sandy loam, dark brown (7.5YR 3/2) moist; moderate medium platy structure parting to weak fine granular; soft, very friable, slightly sticky and nonplastic; few medium and fine and common very fine roots; few very fine irregularly

shaped pores; 20 percent flagstones, 15 percent channers, 10 percent boulders, and 5 percent stones; neutral; abrupt smooth boundary.

Bt1—4 to 11 inches; reddish brown (5YR 5/4) gravelly sandy clay loam; reddish brown (5YR 4/4) moist; strong medium prismatic structure; hard, firm, sticky and plastic; common medium and few coarse to very fine roots; common very fine and few fine tubular pores; many moderately thick clay films on faces of peds; 10 percent pebbles and 5 percent channers; neutral; gradual wavy boundary.

Bt2—11 to 23 inches; yellowish red (5YR 5/6) sandy clay loam; yellowish red (5YR 4/6) moist; moderate coarse prismatic structure; hard, firm, sticky and plastic; few coarse to very fine roots; few fine and very fine tubular pores; common moderately thick clay films on faces of peds; 5 percent pebbles; neutral; gradual wavy boundary.

Bt3—23 to 38 inches; very pale brown (10YR 7/3) with pink (5YR 7/4) fine sandy loam; pale brown (10YR 6/3) with light reddish brown (5YR 6/4) moist; moderate medium prismatic structure parting to moderate medium angular blocky; slightly hard, friable, slightly sticky and slightly plastic; few medium to very fine roots; few fine and common very fine tubular pores; few moderately thick clay films on faces of peds, and common thin clay films on faces of peds and lining pores; 10 percent stones; neutral; gradual wavy boundary.

C and Bt—38 to 66 inches; very pale brown (10YR 7/3) sandy loam (C part), pale brown (10YR 6/3) moist, with reddish yellow (5YR 6/6) fine sandy loam lamellae (Bt part), yellowish red (5YR 5/6) moist; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few medium to very fine roots; clay coatings on sand grains in common thin lamellae 1 to 2 mm thick; 10 percent stones; neutral.

Range in Characteristics

Silicate clay content, control section weighted average: 20 to 35 percent

Depth to base of argillic horizon: 35 to more than 60 inches

Reaction: ranges from neutral to mildly alkaline

A horizon:

Hue: 5YR or 7.5YR

Value: 4 or 5 dry, 2 or 3 moist

Chroma: 2 or 3

Texture: very flaggy fine sandy loam, very flaggy loam, or fine sandy loam

Rock fragments: total range is 0 to 60 percent; 0 to 30 percent pebbles and channers (less than 3 inches long), 0 to 25 percent flagstones, 0 to 5 percent stones, 0 to 10 percent boulders

BA horizon (where present):

Rock fragments: total range is 15 to 30 percent; 5 to 15 percent pebbles and channers (less than 3 inches long), 10 to 15 percent flagstones (less than 10 inches long)

Bt horizons:

Hue: 5YR or 7.5YR

Value: 4 through 6 dry, 3 through 5 moist

Chroma: 3 or 4

Texture: gravelly sandy clay loam, sandy clay loam, or clay loam

Rock fragments: total range is 0 to 20 percent; 0 to 10 percent pebbles, 0 to 5 percent channers, 0 to 5 percent flagstones, 0 to 10 percent stones

Other features: some pedons have texture of fine sandy loam or sandy loam in lower subhorizons of the control section; some pedons have up to 25 percent soft fragments of sandstone, basalt, or tuff-breccia

C and Bt or C horizons:

Hue: 5YR or 7.5YR

Value: 4 through 6 dry, 3 through 5 moist

Chroma: 3 through 6

Texture: sandy loam or fine sandy loam

Rock fragments: total range is 0 to 15 percent; 0 to 5 percent pebbles and channers (less than 3 inches long), 0 to 5 percent cobbles and flagstones (less than 10 inches long), 0 to 10 percent stones

Other features: some pedons have up to 25 percent soft fragments of sandstone, basalt, or tuff-breccia

Lavellga Series

Classification: Loamy-skeletal, carbonatic, mesic Ustollic Haplargids

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately rapid

Landform: Treads of fan terraces

Parent material: Alluvium derived from basalt and sandstone

Slope range: 5 to 15 percent

Elevation: 5,800 to 7,200 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F.

Frost-free period: 130 to 150 days

Typical Pedon

Lavellga very channery fine sandy loam, very stony, in an area of map unit 319—Skyhawk-Lavellga association, 5 to 50 percent slopes; San Juan County, New Mexico; about 7 miles north-northwest of Sanostee; 400 feet west and 2,250 feet north of the southeast corner of sec. 2, T.26N., R.20W.; latitude 36 degrees 30 minutes 58 seconds N and longitude 108 degrees 56 minutes 12 seconds W.

A—0 to 2 inches; brown (7.5YR 5/4) very channery fine sandy loam, dark brown (7.5YR 4/3) moist; moderate thick platy structure parting to weak medium granular; soft, very friable, slightly sticky and nonplastic; common fine and few very fine roots; common very fine irregularly shaped pores; 30 percent channers, 10 percent pebbles, 5 percent flagstones, and 1 percent stones; slightly effervescent; mildly alkaline; clear smooth boundary.

Btk—2 to 6 inches; brown (7.5YR 5/4) very gravelly sandy clay loam, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common fine and very fine roots; few fine and common very fine tubular pores; few thin clay films on faces of peds and lining pores; 25 percent pebbles and 10 percent channers; strongly effervescent, secondary calcium carbonates segregated as common fine irregularly shaped accumulations on undersides of rock fragments; moderately alkaline; clear wavy boundary.

Bk1—6 to 13 inches; light brown (7.5YR 6/4) very gravelly sandy loam, brown (7.5YR 5/4) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and common very fine roots; common very fine tubular pores; very few thin clay films bridging sand grains; 30 percent pebbles and 10 percent cobbles; violently effervescent, secondary calcium carbonates segregated as common medium irregularly shaped accumulations on faces of peds and on

rock fragments and as common medium rounded concretions; strongly alkaline; abrupt wavy boundary.

Bk2—13 to 19 inches; white (10YR 8/1) very cobbly sandy loam, pinkish gray (10YR 7/3) moist; moderate very coarse platy structure parting to moderate coarse subangular blocky; very hard, very firm, slightly sticky and nonplastic; common very fine roots; few very fine tubular pores; 30 percent pebbles and 20 percent cobbles; violently effervescent, matrix is impregnated and partially cemented in places with secondary calcium carbonates, a thin, broken laminar cap present at the top of this horizon; strongly alkaline; clear wavy boundary.

Bk3—19 to 34 inches; white (10YR 8/1) very cobbly sandy loam, pinkish gray (10YR 7/3) moist; weak coarse platy structure parting to moderate medium subangular blocky; hard, firm, slightly sticky and nonplastic; common very fine roots; few very fine tubular pores; few rounded krotovinas; 30 percent cobbles, 20 percent pebbles, and 5 percent stones; violently effervescent, matrix is impregnated and partially cemented in places with secondary calcium carbonates; strongly alkaline; gradual wavy boundary.

Bk4—34 to 50 inches; white (10YR 8/1) extremely cobbly sandy loam, pinkish gray (10YR 7/2) moist; weak medium subangular blocky structure; hard, firm, slightly sticky and nonplastic; few very fine roots; common very fine tubular pores; 35 percent cobbles, 20 percent stones, and 15 percent pebbles; violently effervescent, matrix is impregnated and partially cemented in places with secondary calcium carbonates; strongly alkaline; clear wavy boundary.

2Bk5—50 to 65 inches; pinkish gray (10YR 6/2) very cobbly sandy loam, brown (10YR 5/3) moist; moderate medium angular blocky structure; hard, firm, slightly sticky and nonplastic; few very fine roots; common very fine tubular pores; 25 percent cobbles, 15 percent stones, and 15 percent pebbles; strongly effervescent, secondary calcium carbonates segregated as common medium irregularly shaped accumulations of faces of peds and on rock fragments; very strongly alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 12 to 18 percent

Rock fragment content, control section weighted average: 35 to 60 percent

Depth to base of argillic horizon: 4 to 9 inches

Depth to calcic horizon: 1 or 2 inches

Calcium carbonate equivalent, control section weighted average: 40 to 60 percent

Reaction: ranges from mildly alkaline in the surface to very strongly alkaline in the lower substratum

A horizon:

Hue: 5YR or 7.5YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

Rock fragments: total range is 35 to 60 percent; 30 to 40 percent pebbles and channers (less than 3 inches long),

5 to 15 percent cobbles and flagstones (less than 10 inches long),

0 to 5 percent stones

Btk and Bk1 horizons:

Hue: 5YR or 7.5YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 through 6

Texture: very gravelly sandy clay loam or very gravelly sandy loam

Rock fragments: total range is 35 to 60 percent; 25 to 40 percent pebbles, 10 to 15 percent cobbles, 0 to 5 percent stones

Calcium carbonate equivalent: 20 to 40 percent

Lower Bk horizons:

Hue: 7.5YR or 10YR

Value: 7 or 8 dry, 6 or 7 moist

Chroma: 1 through 4

Texture: very cobbly sandy loam, extremely cobbly sandy loam, or very cobbly fine sandy loam

Rock fragments: total range is 35 to 85 percent; 10 to 30 percent pebbles, 20 to 35 percent cobbles, 5 to 20 percent stones

Calcium carbonate equivalent: 50 to 70 percent

2Bk horizon:

Hue: 7.5YR or 10YR

Value: 6 or 7 dry, 5 or 6 moist

Chroma: 1 through 4

Texture: very cobbly sandy loam or very cobbly fine sandy loam

Rock fragments: total range is 35 to 60 percent; 10 to 20 percent pebbles, 20 to 30 percent cobbles, 5 to 10 percent stones

Calcium carbonate equivalent: 5 to 15 percent

Ligai Series

Classification: Loamy-skeletal, mixed, mesic Typic Argiustolls

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Moderate

Landform: Backslopes of mountains

Parent material: Colluvium, alluvium, and residuum derived from quartz diorite and sandstone

Slope range: 35 to 70 percent

Elevation: 7,000 to 9,000 feet

Mean annual precipitation: 14 to 18 inches

Mean annual air temperature: 45 to 48 degrees F.

Frost-free period: 120 to 140 days

Typical Pedon

Ligai extremely flaggy very fine sandy loam, extremely stony, in an area of map unit 616—Ligai-Pastorpeak-Rock outcrop complex, 35 to 95 percent slopes; Apache County, Arizona; about 7.5 miles southwest of Teec Nos Pos; 1,125 feet east and 50 feet south of the northwest corner of sec. 31, T.40N., R.30E.; latitude 36 degrees 50 minutes 19 seconds N and longitude 109 degrees 10 minutes 15 seconds W.

A—0 to 2 inches; reddish brown (5YR 4/3) extremely flaggy very fine sandy loam, dark reddish brown (5YR 3/2) moist; weak thick platy structure parting to moderate medium granular; soft, very friable, slightly sticky and nonplastic; few medium and common fine and very fine roots; common very fine irregularly shaped pores; 40 percent flagstones, 10 percent stones, 10 percent channers, and 10 percent pebbles; neutral; clear smooth boundary.

Bt—2 to 7 inches; reddish brown (5YR 4/3) very flaggy sandy clay loam, dark reddish brown (5YR 3/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few coarse and fine, and common medium and very fine roots; few fine and very fine tubular pores; few thin clay films on faces of peds and lining pores; 20 percent pebbles, 15 percent flagstones, 5 percent cobbles, and 5 percent channers; neutral; clear smooth boundary.

Btk1—7 to 16 inches; reddish brown (5YR 5/4) very flaggy sandy clay loam, dark reddish brown (5YR 3/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and

slightly plastic; few coarse and common medium, fine, and very fine roots; few very fine tubular pores; common thin clay films on faces of peds and on rock fragments; 25 percent flagstones, 10 percent pebbles, 5 percent cobbles, and 5 percent stones; noneffervescent in fine earth, strongly effervescent on undersides of rock fragments where secondary calcium carbonates are segregated as common medium irregularly shaped accumulations; neutral; gradual wavy boundary.

Btk2—16 to 25 inches; reddish brown (5YR 5/4) extremely flaggy sandy clay loam, dark reddish brown (5YR 3/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common medium and few coarse, fine, and very fine roots; few fine and very fine irregularly shaped pores; common thin clay films on faces of peds and on rock fragments; 35 percent flagstones, 15 percent cobbles, 10 percent stones, and 10 percent pebbles; noneffervescent in fine earth, violently effervescent on undersides of rock fragments where secondary calcium carbonates are segregated as common medium irregularly shaped accumulations; neutral; abrupt irregular boundary.

R—25 inches; quartz diorite bedrock; contact is angular and has few fractures.

Range in Characteristics

Soil depth: 20 to 40 inches

Silicate clay content, control section weighted average: 20 to 27 percent

Rock fragment content, control section weighted average: 35 to 80 percent

Depth to base of mollic epipedon: 7 to 18 inches

Depth to base of argillic horizon: 20 to 40 inches

Reaction: ranges from neutral in the surface to mildly alkaline in the lower subsoil

A horizon:

Hue: 5YR or 7.5YR

Value: 4 or 5 dry

Rock fragments: total range is 60 to 80 percent; 20 to 25 percent pebbles and channers (less than 3 inches long), 35 to 40 percent flagstones (less than 10 inches long),

0 to 5 percent cobbles,

5 to 10 percent stones

Bt horizon:

Hue: 5YR or 7.5YR

Value: 4 or 5 dry

Texture: very flaggy sandy clay loam or very cobbly sandy clay loam

Rock fragments: total range is 35 to 60 percent; 10 to 15 percent pebbles and channers (less than 3 inches long), 25 to 35 percent flagstones (less than 10 inches long), 5 to 10 percent stones

Btk horizons:

Hue: 5YR or 7.5YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 through 6

Texture: very flaggy sandy clay loam or extremely flaggy sandy clay loam

Rock fragments: total range is 35 to 80 percent; 10 to 25 percent pebbles and channers (less than 3 inches long), 25 to 45 percent flagstones (less than 10 inches long), 5 to 10 percent stones

Other features: some pedons lack calcium carbonate accumulations

Littlehat Series

Classification: Fine-silty, mixed (calcareous), mesic Typic Torriorthents

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Moderate

Landform: Summits, footslopes, and backslopes of undulating plateaus

Parent material: Alluvium and residuum derived from siltstone and shale

Slope range: 1 to 45 percent

Elevation: 5,000 to 5,600 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Littlehat silt loam, in an area of map unit 250—Littlehat-Persayo-Nataani complex, 0 to 15 percent slopes; San Juan County, New Mexico; about 9.5 miles south of Shiprock and 0.25 mile south of Sulphur Spring; 2,200 feet south and 1,000 feet east of the northwest corner of sec. 24, T.28N., R.18W.; latitude 36 degrees 38 minutes 55 seconds N and longitude 108 degrees 42 minutes 57 seconds W.

ABy—0 to 2 inches; light yellowish brown (2.5Y 6/4) silt loam, light olive brown (2.5Y 5/4) moist; strong very thick platy structure; soft, very

friable, slightly sticky and slightly plastic; few very fine roots; many very fine vesicular pores; secondary fine sand-sized gypsum crystals segregated in few fine irregularly shaped filaments and seams; violently effervescent; moderately alkaline; clear smooth boundary.

BCy—2 to 10 inches; light yellowish brown (2.5Y 6/4) silt loam, light olive brown (2.5Y 5/4) moist; moderate coarse prismatic structure parting to weak coarse subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; common very fine vesicular pores; secondary fine sand-sized gypsum crystals segregated in few fine irregularly shaped filaments; strongly effervescent; moderately alkaline; clear wavy boundary.

C1—10 to 23 inches; grayish brown (2.5Y 5/2) silt loam, dark grayish brown (2.5Y 4/2) moist; weak fine subangular blocky structure; soft, very friable, sticky and slightly plastic; few fine and common very fine roots; 5 percent soft siltstone fragments; few lenses of coarse sand-sized primary gypsum crystals; strongly effervescent; strongly alkaline; clear smooth boundary.

C2—23 to 31 inches; light brownish gray (2.5Y 6/2) silt loam, grayish brown (2.5Y 5/2) moist; massive; platy rock structure; soft, very friable, sticky and slightly plastic; few fine and common very fine roots; 15 percent soft siltstone fragments; few lenses of coarse sand-sized primary gypsum crystals; strongly effervescent; strongly alkaline; clear smooth boundary.

Cr—31 inches; siltstone bedrock.

Range in Characteristics

Soil depth: 20 to 40 inches

Silicate clay content, control section weighted average: 18 to 35 percent

Reaction: ranges from moderately alkaline to strongly alkaline

ABy horizon:

Hue: 10YR or 2.5Y

Chroma: 3 or 4

Salinity, mmhos/cm: 4 to 16

Sodicity, SAR: 13 to 30

Gypsum content: 1 to 10 percent

BCy and C horizons:

Hue: 10YR or 2.5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 through 4

Texture: loam, silt loam, or silty clay loam

Salinity, mmhos/cm: 8 to 35

Sodicity, SAR: 30 to 100

Gypsum content: 1 to 5 percent

Other features: 0 to 35 percent soft siltstone fragments

Mack Series

Classification: Fine-loamy, mixed, mesic Typic Haplargids

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: High stream terraces and fan terraces

Parent material: Alluvium and eolian material derived from sandstone and shale

Slope range: 1 to 4 percent

Elevation: 5,500 to 6,300 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Mack fine sandy loam, in an area of map unit 210—Mack-Mesa fine sandy loams, 1 to 4 percent slopes; San Juan County, New Mexico; about 2 miles north-northwest of Two Grey Hills Trading Post; 2,000 feet west and 1,000 feet south of the northeast corner of sec. 2, T.23N., R.19W.; latitude 36 degrees 15 minutes 37 seconds N and longitude 108 degrees 50 minutes 1 second W.

A1—0 to 2 inches; brown (7.5YR 4/4) fine sandy loam, dark brown (7.5YR 3/2) moist; weak thin platy structure parting to weak fine granular; soft, very friable, slightly sticky and nonplastic; few medium, fine, and very fine roots; few fine and very fine irregularly shaped pores; 5 percent pebbles; slightly effervescent; mildly alkaline; clear smooth boundary.

A2—2 to 4 inches; brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/4) moist; moderate medium platy structure parting to weak fine granular; slightly hard, very friable, slightly sticky and nonplastic; few medium and very fine, and common fine roots; few fine irregularly shaped pores; 5 percent pebbles; slightly effervescent; mildly alkaline; clear wavy boundary.

BA—4 to 8 inches; brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/4) moist; weak coarse subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; common fine and very fine roots; few very fine tubular

pores; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bt—8 to 15 inches; light brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 5/4) moist; moderate medium and coarse subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few fine and very fine roots; few fine and very fine tubular pores; few thin clay films on faces of peds and lining pores; strongly effervescent; moderately alkaline; clear wavy boundary.

Btk—15 to 24 inches; light brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 5/4) moist; weak coarse subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few fine and very fine roots; few very fine tubular pores; few thin clay films lining pores and bridging sand grains; violently effervescent, secondary calcium carbonates segregated in common medium irregularly shaped accumulations on faces of peds and in soft masses; strongly alkaline; gradual irregular boundary.

Bk1—24 to 38 inches; pinkish white (7.5YR 8/2) sandy loam, pinkish gray (7.5YR 7/2) moist; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; few very fine tubular pores; 5 percent pebbles; violently effervescent, secondary calcium carbonates segregated as many fine irregularly shaped accumulations in soft masses; moderately alkaline; clear wavy boundary.

Bk2—38 to 49 inches; pink (7.5YR 7/4) sandy loam, light brown (7.5YR 6/4) moist; weak coarse subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; few fine roots; few very fine tubular pores; 5 percent pebbles; violently effervescent, secondary calcium carbonates segregated as few fine irregularly shaped accumulations on faces of peds and in soft masses; moderately alkaline; clear wavy boundary.

Bk3—49 to 65 inches; light brown (7.5YR 6/4) sandy loam, brown (7.5YR 5/4) moist; moderate medium and coarse subangular blocky structure; hard, friable, slightly sticky and nonplastic; few very fine roots; few very fine tubular pores; strongly effervescent, secondary calcium carbonates segregated as few fine irregularly shaped accumulations on faces of peds; moderately alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 18 to 27 percent

Depth to base of argillic horizon: 15 to 32 inches

Depth to calcic horizon: 13 to 30 inches

Reaction: ranges from mildly alkaline in the surface to strongly alkaline in the substratum

A1 horizon:

Value: 3 or 4 moist

Chroma: 3 or 4

Rock fragments: 0 to 10 percent pebbles

A2 and BA horizon:

Value: 3 or 4 moist

Chroma: 3 or 4

Rock fragments: 0 to 5 percent pebbles

Calcium carbonate equivalent: 5 to 10 percent

Bt horizon:

Hue: 5YR or 7.5YR

Value: 5 or 6 dry, 4 or 5 moist

Texture: sandy clay loam or fine sandy loam

Rock fragments: 0 to 10 percent pebbles

Calcium carbonate equivalent: 5 to 10 percent

Btk horizons:

Hue: 5YR or 7.5YR

Value: 5 or 6 dry, 4 or 5 moist

Rock fragments: 0 to 10 percent pebbles

Calcium carbonate equivalent: 5 to 25 percent, with at least one subhorizon more than 6 inches thick having more than 15 percent

Bk horizons:

Value: 6 through 8 dry, 5 through 7 moist

Chroma: 2 through 4

Texture: sandy loam or loam

Rock fragments: 0 to 10 percent pebbles

Calcium carbonate equivalent: 5 to 40 percent, with at least one subhorizon more than 6 inches thick having more than 15 percent

Marjane Series

Classification: Coarse-loamy, mixed, mesic Ustalfic Haplargids

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Moderately rapid

Landform: Footslopes and summits of plateaus and mesas

Parent material: Eolian material and residuum derived from sandstone

Slope range: 2 to 5 percent

Elevation: 5,600 to 6,500 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F.

Frost-free period: 130 to 150 days

Typical Pedon

Marjane fine sandy loam, in an area of map unit 313—Marjane-Kitsili complex, 2 to 8 percent slopes; Apache County, Arizona; about 5 miles south-southeast of Red Mesa Trading Post; 1,450 feet north and 2,450 feet east of the southwest corner of sec. 10, T.40N., R.28E.; latitude 36 degrees 53 minutes 10 seconds N and longitude 109 degrees 19 minutes 41 seconds W.

A—0 to 2 inches; yellowish red (5YR 4/6) fine sandy loam, dark reddish brown (5YR 3/4) moist; moderate very coarse platy structure parting to moderate coarse subangular blocky; soft, very friable, nonsticky and nonplastic; common very fine and few fine roots; common very fine irregularly shaped pores; slightly effervescent; mildly alkaline; abrupt smooth boundary.

BA—2 to 11 inches; yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) moist; weak coarse subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine and few medium and fine roots; common very fine tubular pores; slightly effervescent; moderately alkaline; clear smooth boundary.

Bt—11 to 18 inches; yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) moist; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common very fine and few fine roots; common very fine tubular pores; few thin clay films on faces of peds and lining pores; strongly effervescent; moderately alkaline; clear smooth boundary.

Btk—18 to 28 inches; light reddish brown (5YR 6/4) fine sandy loam, reddish brown (5YR 4/4) moist; moderate coarse subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common very fine and few fine roots; few very fine tubular pores; many thin clay films on faces of peds and lining pores; violently effervescent, secondary calcium carbonates segregated in few fine irregularly shaped soft masses and as accumulations on faces of peds; moderately alkaline; abrupt smooth boundary.

2R—28 inches; sandstone bedrock.

Range in Characteristics

Soil depth: 20 to 40 inches

Silicate clay content, control section weighted average: 8 to 18 percent

Depth to base of argillic horizon: 20 to 40 inches

Depth to calcic horizon: 18 to 28 inches

Reaction: ranges from mildly alkaline in the surface to moderately alkaline in the subsoil and substratum

A horizon:

Value: 4 through 6 dry, 3 through 5 moist

Chroma: 4 or 6

BA and Bt horizons:

Value: 5 or 6 dry, 4 or 5 moist

Texture: fine sandy loam or very fine sandy loam

Calcium carbonate equivalent: 1 to 5 percent

Btk horizon:

Value: 5 through 7 dry, 4 through 6 moist

Chroma: 4 or 6

Texture: fine sandy loam or very fine sandy loam

Calcium carbonate equivalent: 5 to 10 percent

Other features: some pedons have texture of loam

McElmo Series

Classification: Fine, montmorillonitic, mesic Vertic Natrargids

Depth class: Deep

Drainage class: Well drained

Permeability: Slow

Landform: Dipslopes of cuestas

Parent material: Alluvium and residuum derived from shale and sandstone

Slope range: 5 to 15 percent

Elevation: 5,300 to 6,300 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F.

Frost-free period: 130 to 150 days

Typical Pedon

McElmo very gravelly sandy clay loam, in an area of map unit 308—McElmo-Farview complex, 2 to 15 percent slopes; San Juan County, New Mexico; about 16 miles west-southwest of Shiprock; 2,500 feet north and 1,000 feet east of the southwest corner of sec. 9, T.29N., R.20W.; latitude 36 degrees 44 minutes 27 seconds N and longitude 108 degrees 58 minutes 2 seconds W.

A—0 to 1 inch; light reddish brown (5YR 6/4) very gravelly sandy clay loam. reddish brown (5YR 4/4) moist; moderate very thick platy structure; slightly hard, friable, slightly sticky and slightly

plastic; few very fine roots; many very fine vesicular pores; 45 percent angular pebbles and 10 percent angular cobbles; strongly effervescent; moderately alkaline; abrupt smooth boundary.

2B_{tn}/E—1 to 4 inches; yellowish red (5YR 5/6) with pink (5YR 7/3) gravelly clay, yellowish red (5YR 4/6) with light reddish brown (5YR 6/4) moist; strong medium prismatic structure parting to strong fine angular blocky; hard, friable, very sticky and very plastic; few fine and common very fine roots; many very fine irregularly shaped pores; upper 1 inch of prisms has some uncoated sand grains (E part); common thin clay films on faces of peds and lining pores; 20 percent angular pebbles; strongly effervescent, secondary calcium carbonates segregated in very few fine irregularly shaped accumulations on faces of peds; strongly alkaline; clear smooth boundary.

2B_{tkn}—4 to 14 inches; light reddish brown (5YR 6/4) clay, yellowish red (5YR 4/6) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, very firm, very sticky and very plastic; few medium and common fine and very fine roots; few very fine tubular pores; common moderately thick clay films on faces of peds; 10 percent angular pebbles; strongly effervescent, secondary calcium carbonates segregated in few fine and medium irregularly shaped accumulations on faces of peds; strongly alkaline; clear irregular boundary.

3B_{ky}—14 to 30 inches; pink (5YR 7/3) cobbly silty clay loam, light reddish brown (5YR 6/4) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few medium and very fine roots; common very fine tubular pores; 15 percent angular cobbles and 10 percent angular pebbles; secondary fine sand-sized gypsum crystals in few fine irregularly shaped accumulations as soft masses; violently effervescent, secondary calcium carbonates segregated in common medium and large irregularly shaped accumulations as soft masses and on rock fragments; strongly alkaline; clear wavy boundary.

3B_{yk}—30 to 41 inches; pink (5YR 7/3) gypsiferous material which is an apparent silty clay loam, light reddish brown (5YR 6/4) moist; weak coarse

subangular blocky structure; slightly hard, friable, sticky and plastic; few fine and very fine roots; common very fine tubular pores; 30 percent soft shale fragments; 5 percent angular pebbles; secondary fine sand-sized gypsum crystals in common fine and medium irregularly shaped accumulations on faces of peds and on rock fragments; strongly effervescent, secondary calcium carbonates in few medium irregularly shaped accumulations on rock fragments; moderately alkaline; clear irregular boundary.

3C_y—41 to 54 inches; pink (5YR 7/3) gypsiferous material which is an apparent silty clay loam, light reddish brown (5YR 6/4) moist; massive, platy rock structure; slightly hard, friable, sticky and plastic; few very fine roots; few very fine irregularly shaped pores; 60 percent soft shale fragments; secondary fine sand-sized gypsum crystals in few fine irregularly shaped accumulations on rock fragments; slightly effervescent, secondary calcium carbonates segregated in very few fine irregularly shaped accumulations on rock fragments; mildly alkaline; clear irregular boundary.

3C_r—54 inches; shale bedrock; with very few roots and few accumulations of secondary gypsum.

Range in Characteristics

Soil depth: 40 to 60 inches

Silicate clay content, control section weighted average: 40 to 60 percent

Depth to base of natric horizon: 10 to 25 inches

Depth to calcic horizon: 5 to 25 inches

Depth to gypsic horizon: 25 to 40 inches

Reaction: ranges from mildly alkaline in the surface to strongly alkaline in the subsoil

A horizon:

Hue: 5YR or 7.5YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 through 6

Rock fragments: total range is 35 to 60 percent; 35 to 50 percent pebbles, 0 to 10 percent cobbles

Salinity, mmhos/cm: 0 to 2

Sodicity, SAR: 0 to 5

B_{tn}/E horizon:

Hue: 5YR or 7.5YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 through 6

Texture: gravelly clay or clay

Rock fragments: 0 to 20 percent pebbles

Salinity, mmhos/cm: 2 to 4

Sodicity, SAR: 13 to 30

Btkn horizon:

Hue: 5YR or 7.5YR

Value: 5 through 7 dry, 4 or 5 moist

Chroma: 4 through 6

Texture: clay or silty clay

Rock fragments: 0 to 10 percent pebbles

Salinity, mmhos/cm: 2 to 4

Sodicity, SAR: 13 to 30

Calcium carbonate equivalent: 10 to 25 percent

Bky horizon:

Hue: 5YR through 5Y

Value: 6 or 7 dry, 5 through 7 moist

Chroma: 1 through 4

Texture: silty clay, clay loam, or cobbly silty clay loam

Clay content: 35 to 50 percent

Rock fragments: total range is 0 to 25 percent;

0 to 10 percent pebbles,

0 to 15 percent cobbles

Salinity, mmhos/cm: 8 to 16

Sodicity, SAR: 5 to 13

Calcium carbonate equivalent: 15 to 25 percent

Gypsum content: 2 to 5 percent

Other features: 0 to 15 percent soft shale fragments

Byk horizon:

Hue: 5YR through 5GY

Value: 7 or 8 dry, 5 through 7 moist

Chroma: 1 through 4

Texture: gypsiferous material which is an apparent silty clay loam or silty clay

Rock fragments: 0 to 10 percent pebbles

Salinity, mmhos/cm: 8 to 16

Sodicity, SAR: 5 to 13

Calcium carbonate equivalent: 5 to 10 percent

Gypsum content: 10 to 30 percent

Other features: 10 to 30 percent soft shale fragments

Cy horizon:

Hue: 5YR through 5GY

Value: 5 through 8 dry, 4 through 7 moist

Chroma: 1 through 4

Texture: gypsiferous material which is an apparent silty clay or silty clay loam

Salinity, mmhos/cm: 8 to 16

Sodicity, SAR: 5 to 13

Gypsum content: 10 to 20 percent

Other features: 50 to 75 percent soft shale fragments

Menefee Series

Classification: Loamy, mixed (calcareous), mesic, shallow Aridic Ustorthents

Depth class: Shallow

Drainage class: Well drained

Permeability: Moderately slow

Landform: Footslopes of hills and backslopes of escarpments

Parent material: Alluvium, colluvium, and residuum derived from siltstone, shale, and sandstone

Slope range: 10 to 55 percent

Elevation: 6,400 to 8,000 feet

Mean annual precipitation: 12 to 16 inches

Mean annual air temperature: 48 to 50 degrees F.

Frost-free period: 120 to 140 days

Typical Pedon

Menefee channery loam, in an area of map unit 412—Highdye-Menefee association, 5 to 35 percent slopes; San Juan County, New Mexico; about 7.5 miles south-southwest of Sanostee; 1,475 feet east and 50 feet north of the southwest corner of sec. 12, T.24N., R.20W.; latitude 36 degrees 19 minutes 16 seconds N and longitude 108 degrees 55 minutes 49 seconds W.

A—0 to 2 inches; brown (10YR 5/3) channery loam, dark brown (10YR 4/3) moist; moderate medium platy structure parting to weak medium granular; soft, very friable, slightly sticky and slightly plastic; few fine and very fine roots; few very fine vesicular pores; 15 percent channers; strongly effervescent; moderately alkaline; clear smooth boundary.

2BCK—2 to 5 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; weak medium granular structure; soft, friable, slightly sticky and slightly plastic; few medium, many fine, and common very fine roots; few very fine tubular pores; 10 percent soft siltstone fragments; 5 percent channers; strongly effervescent, secondary calcium carbonates segregated as few fine irregularly shaped accumulations on rock fragments; moderately alkaline; clear smooth boundary.

2Ck—5 to 17 inches; light yellowish brown (2.5YR 6/4) loam, light olive brown (2.5YR 5/4) moist; massive, platy rock structure; slightly hard,

friable, slightly sticky and slightly plastic; few coarse to very fine, and common fine roots; few medium and fine irregularly shaped pores; 70 percent soft siltstone fragments; strongly effervescent, secondary calcium carbonates segregated as common medium irregularly shaped accumulations on rock fragments; moderately alkaline; clear smooth boundary.

2Cr—17 inches; siltstone bedrock.

Range in Characteristics

Soil depth: 10 to 20 inches

Silicate clay content, control section weighted average: 18 to 35 percent

A horizon:

Hue: 10YR or 2.5Y

Chroma: 2 through 4

Texture: channery loam or very channery clay loam

Rock fragments: total range is 15 to 60 percent;

15 to 40 percent channers,

0 to 10 percent flagstones,

0 to 10 percent boulders and stones

Calcium carbonate equivalent: 3 to 10 percent

B_{ck} or C_k horizons:

Hue: 10YR or 2.5Y

Value: 5 through 7 dry, 4 or 5 moist

Chroma: 2 through 4

Texture: loam, clay loam, or silty clay loam

Rock fragments: 0 to 5 percent channers

Calcium carbonate equivalent: 3 to 15 percent

Other features: 10 to 80 percent soft siltstone or shale fragments

Mesa Series

Classification: Fine-loamy, mixed, mesic Typic Haplargids

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate to slow in upper part, rapid to moderately slow in lower part

Landform: Treads of high stream terraces and fan terraces

Parent material: Alluvium and eolian material derived from sandstone, shale, quartzite, and granite

Slope range: 0 to 4 percent

Elevation: 4,900 to 6,300 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Mesa fine sandy loam, in an area of map unit 210—Mack-Mesa fine sandy loams, 1 to 4 percent slopes; San Juan County, New Mexico; about 1 mile south of Two Grey Hills Trading Post; 2,100 feet east and 550 feet north of the southwest corner of sec. 18, T.23N., R.18W.; latitude 36 degrees 13 minutes 19 seconds N and longitude 108 degrees 48 minutes 6 seconds W.

A—0 to 3 inches; brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; weak thin platy structure parting to weak fine granular; soft, very friable, slightly sticky and nonplastic; common fine and few medium and very fine roots; few fine and very fine irregularly shaped pores; 5 percent pebbles; very slightly effervescent; mildly alkaline; clear smooth boundary.

B_{t1}—3 to 11 inches; brown (7.5YR 4/4) sandy clay loam, dark brown (7.5YR 3/2) moist; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few medium and common fine and very fine roots; few fine tubular pores; few thin clay films on faces of peds and lining pores; 10 percent pebbles; slightly effervescent; mildly alkaline; clear wavy boundary.

B_{t2}—11 to 20 inches; brown (7.5YR 5/4) sandy clay loam, brown (7.5YR 4/4) moist; slightly hard, friable, slightly sticky and plastic; common fine and very fine roots; few fine tubular pores; few thin clay films on faces of peds and lining pores; 10 percent pebbles; slightly effervescent; moderately alkaline; gradual smooth boundary.

B_{tk}—20 to 32 inches; brown (7.5YR 5/4) gravelly sandy clay loam, brown (7.5YR 4/4) moist; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and few very fine root; few fine tubular pores; few thin clay films on faces of peds and lining pores; 10 percent pebbles and 5 percent cobbles; strongly effervescent, secondary calcium carbonates segregated as many fine and medium irregularly shaped accumulations in soft masses and on rock fragments; moderately alkaline; gradual wavy boundary.

B_{k1}—32 to 45 inches; pink (7.5YR 7/4) very cobbly

sandy loam, light brown (7.5YR 6/4) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; 20 percent pebbles, 15 percent cobbles, and 5 percent stones; violently effervescent, secondary calcium carbonates segregated as common medium and large irregularly shaped accumulations in soft masses and on rock fragments; moderately alkaline; gradual wavy boundary.

Bk2—45 to 57 inches; pinkish white (7.5YR 8/2) very cobbly sandy loam, pinkish gray (7.5YR 7/2) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and nonplastic; few fine roots; 25 percent pebbles, 15 percent cobbles, and 5 percent stones; violently effervescent, secondary calcium carbonates segregated as many medium irregularly shaped accumulations in soft masses and on rock fragments; moderately alkaline; clear wavy boundary.

Bk3—57 to 64 inches; pink (7.5YR 7/4) very gravelly sandy loam, light brown (7.5YR 6/4) moist; weak coarse subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots; 40 percent pebbles and 5 percent cobbles; violently effervescent, secondary calcium carbonates segregated as common fine and medium irregularly shaped accumulations in soft masses and on rock fragments; strongly alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 20 to 35 percent

Depth to base of argillic horizon: 15 to 35 inches

Depth to calcic horizon: 10 to 35 inches

Depth to skeletal discontinuity: 20 to 40 inches

Reaction: ranges from mildly alkaline in the surface to strongly alkaline in the substratum

Depth to seasonal high water table: occurs in pedons in map units 290 and 295 at 3.5 to 5.0 feet as a result of irrigation water losses

A horizon:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 3 through 5 moist

Chroma: 3 or 4

Texture: fine sandy loam, sandy clay loam, or clay loam

Bt and Btk horizons:

Value: 5 or 6 dry

Chroma: 2 through 4

Texture: sandy clay loam, gravelly sandy clay loam, or clay loam

Rock fragments: total range is 0 to 25 percent; 0 to 20 percent pebbles,

0 to 5 percent cobbles

Calcium carbonate equivalent: 5 to 15 percent

Bk horizons:

Hue: 7.5YR or 10YR

Value: 6 through 8 dry, 4 through 7 moist

Chroma: 2 through 4

Texture: gravelly loam, gravelly sandy clay loam, very cobbly sandy loam, very gravelly sandy loam, very gravelly sandy clay loam

Rock fragments: total range is 15 to 60 percent; 10 to 40 percent pebbles,

5 to 25 percent cobbles,

0 to 5 percent stones

Calcium carbonate equivalent: 5 to 40 percent, with at least one subhorizon more than 6 inches thick having more than 15 percent

BCK and C horizons (where present):

Hue: 7.5YR or 10YR

Value: 5 through 7 dry, 4 or 5 moist

Chroma: 2 through 4

Texture: stratified very cobbly coarse sandy loam to very cobbly coarse sand

Rock fragments: total range is 40 to 60 percent; 25 to 35 percent pebbles,

15 to 20 percent cobbles,

0 to 5 percent stones

Calcium carbonate equivalent: 3 to 10 percent

Other features: some pedons have texture of clay loam below 40 inches

Mido Series

Classification: Mixed, mesic Ustic Torripsamments

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Rapid

Landform: Stable dunes

Parent material: Eolian material derived from sandstone

Slope range: 4 to 45 percent

Elevation: 5,600 to 6,500 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F.

Frost-free period: 130 to 150 days

Typical Pedon

Mido loamy fine sand, in an area of map unit 306—Arches-Kitsili-Mido complex, 1 to 25 percent slopes;

San Juan County, New Mexico; about 19.5 miles southwest of Shiprock; 2,050 feet north and 1,250 feet west of the southeast corner of sec. 28, T.28N., R.20W.; latitude 36 degrees 37 minutes 52 seconds N and longitude 108 degrees 58 minutes 28 seconds W.

A—0 to 3 inches; yellowish red (5YR 5/6) loamy fine sand, yellowish red (5YR 4/6) moist; massive; soft, very friable, nonsticky and nonplastic; common fine and few very fine roots; slightly effervescent; moderately alkaline; gradual wavy boundary.

C1—3 to 16 inches; yellowish red (5YR 5/6) loamy fine sand, yellowish red (5YR 4/6) moist; massive; soft, very friable, nonsticky and nonplastic; few coarse and common fine roots; few very fine tubular pores; slightly effervescent; moderately alkaline; gradual wavy boundary.

C2—16 to 62 inches; yellowish red (5YR 5/6) loamy fine sand, yellowish red (5YR 4/6) moist; massive; soft, very friable, nonsticky and nonplastic; few medium and very fine roots; few very fine tubular pores; slightly effervescent; moderately alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 4 to 8 percent

A horizon:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 or 6

C horizons:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 or 6

Texture: loamy fine sand or fine sand

Millett Series

Classification: Fine-loamy, mixed, mesic Ustollic Haplargids

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Treads of fan terraces and footslopes of stable landslides

Parent material: Alluvium and colluvium derived from sandstone and quartz diorite

Slope range: 2 to 35 percent

Elevation: 5,600 to 7,000 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F.

Frost-free period: 130 to 150 days

Typical Pedon

Millett gravelly fine sandy loam, in an area of map unit 310—Millett-Blanding-Strych association, 2 to 50 percent slopes; Apache County, Arizona; about 9 miles north of Red Rock Trading Post; 400 feet west and 2,350 feet north of the southeast corner of sec. 6, T.38N., R.31E.; latitude 36 degrees 43 minutes 46 seconds N and longitude 109 degrees 3 minutes 1 second W.

A—0 to 2 inches; yellowish red (5YR 5/6) gravelly fine sandy loam, yellowish red (5YR 4/6) moist; weak medium platy structure parting to moderate fine granular; soft, very friable, slightly sticky and nonplastic; common very fine roots; few very fine irregularly shaped pores; 15 percent pebbles; slightly effervescent; mildly alkaline; clear smooth boundary

Bt—2 to 6 inches; reddish brown (5YR 5/4) gravelly fine sandy loam, reddish brown (5YR 4/4) moist; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few medium to very fine roots; common very fine tubular pores; few thin clay films on faces of peds and lining pores; 15 percent pebbles; strongly effervescent; moderately alkaline; clear smooth boundary.

Btk—6 to 16 inches; light reddish brown (5YR 6/4) gravelly sandy clay loam, reddish brown (5YR 5/4) moist; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and few very fine roots; common fine tubular pores; few thin clay films on faces of peds and lining pores; 20 percent pebbles and 5 percent cobbles; violently effervescent, secondary calcium carbonates segregated as common medium irregularly shaped accumulations on faces of peds and on rock fragments; moderately alkaline; clear wavy boundary.

Bk1—16 to 31 inches; white (N 8/0) very gravelly sandy loam, pink (5YR 7/3) moist; moderate fine subangular blocky structure; hard, friable, slightly sticky and nonplastic; few medium to very fine roots; 40 percent pebbles and 10 percent cobbles; violently effervescent, matrix is impregnated and partially cemented in places with secondary calcium carbonates; strongly alkaline; gradual wavy boundary.

Bk2—31 to 44 inches; pink (5YR 7/4) very cobbly sandy loam, light reddish brown (5YR 6/4) moist;

weak coarse subangular blocky structure; very hard, friable, slightly sticky and nonplastic; few fine and very fine roots; 30 percent pebbles and 20 percent cobbles; violently effervescent, secondary calcium carbonates segregated as many fine and medium irregularly shaped accumulations on faces of peds and on rock fragments; strongly alkaline; clear wavy boundary.

Bk3—44 to 64 inches; reddish brown (5YR 5/4) very cobbly sandy loam, reddish brown (5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; 30 percent pebbles and 30 percent cobbles; strongly effervescent, secondary calcium carbonates segregated as few fine irregularly shaped accumulations on rock fragments; moderately alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 18 to 27 percent

Rock fragment content, control section weighted average: 15 to 35 percent

Depth to base of argillic horizon: 14 to 30 inches

Depth to calcic horizon: 6 to 14 inches

Reaction: ranges from neutral in the surface to strongly alkaline in the substratum

A horizon:

Hue: 5YR or 7.5YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 through 6

Texture: gravelly fine sandy loam and very cobbly fine sandy loam

Rock fragments: total range is 15 to 60 percent;

15 to 25 percent pebbles,

0 to 30 percent cobbles,

0 to 5 percent stones,

0 to 5 percent boulders

Bt and Btk horizons:

Hue: 5YR or 7.5YR

Value: 4 through 6 dry, 3 through 5 moist

Chroma: 3 through 6

Texture: gravelly fine sandy loam, gravelly sandy clay loam, or cobbly sandy clay loam

Rock fragments: total range is 15 to 35 percent;

5 to 25 percent pebbles,

0 to 20 percent cobbles,

0 to 5 percent stones

Calcium carbonate equivalent: 1 to 30 percent

Bk1 horizon:

Hue: 5YR, 7.5YR, or N (neutral)

Value: 5 through 8 dry, 4 through 7 moist

Chroma: 0 through 4

Texture: very gravelly sandy loam, very gravelly fine sandy loam, very cobbly fine sandy loam, or very cobbly sandy loam

Rock fragments: total range is 35 to 60 percent;

10 to 45 percent pebbles,

5 to 35 percent cobbles,

0 to 10 percent stones

Calcium carbonate equivalent: 15 to 40 percent

Lower Bk horizons:

Hue: 5YR or 7.5YR

Value: 5 through 8 dry, 4 through 7 moist

Chroma: 2 through 4

Texture: very cobbly sandy loam very cobbly fine sandy loam, or very gravelly fine sandy loam

Rock fragments: total range is 35 to 60 percent;

15 to 30 percent pebbles,

15 to 30 percent cobbles,

0 to 5 percent stones,

0 to 5 percent boulders

Salinity, mmhos/cm: 0 to 4

Sodicity, SAR: 5 to 13

Calcium carbonate equivalent: 5 to 10 percent

Moffat Series

Classification: Coarse-loamy, mixed, mesic Typic Calciorthids

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately rapid

Landform: Fan terraces

Parent material: Eolian material and alluvium derived from sandstone and siltstone

Slope range: 1 to 12 percent

Elevation: 4,900 to 5,600 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 54 to 56 degrees F.

Frost-free period: 150 to 170 days

Typical Pedon

Moffat loamy fine sand, in an area of map unit 517—Moffat loamy fine sand, 1 to 12 percent slopes; Apache County, Arizona; about 4.5 miles north-northeast of Mexican Water Trading Post; 1,200 feet north and 350 feet east of the southwest corner of sec. 4, T.41N., R.26E.; latitude 36 degrees 59 minutes 5 seconds N and longitude 109 degrees 34 minutes 13 seconds W.

A—0 to 6 inches; yellowish red (5YR 5/6) loamy fine sand, yellowish red (5YR 4/6) moist; weak thick platy structure parting to weak medium granular;

soft, very friable, nonsticky and nonplastic; few fine and common very fine roots; common very fine irregularly shaped pores; 5 percent pebbles; slightly effervescent; mildly alkaline; clear smooth boundary.

2Bk1—6 to 18 inches; reddish yellow (5YR 6/6) fine sandy loam, yellowish red (5YR 4/6) moist; weak coarse subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few fine and common very fine roots; few fine and very fine tubular pores; 5 percent pebbles; strongly effervescent, secondary calcium carbonates segregated as few fine irregularly shaped accumulations on faces of peds and on rock fragments; moderately alkaline; clear smooth boundary.

2Bk2—18 to 28 inches; reddish yellow (5YR 6/6) fine sandy loam, yellowish red (5YR 4/6) moist; moderate coarse subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; few medium, fine, and very fine roots; few fine and very fine tubular pores; 5 percent pebbles; violently effervescent, secondary calcium carbonates segregated as common fine irregularly shaped accumulations on faces of peds and on rock fragments; moderately alkaline; abrupt wavy boundary.

2Bk3—28 to 33 inches; pink (5YR 7/4) fine sandy loam, light reddish brown (5YR 6/4) moist; weak medium platy structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and nonplastic; few fine and common very fine roots; common very fine irregularly shaped pores; 5 percent pebbles; violently effervescent, secondary calcium carbonates segregated as many medium irregularly shaped soft masses; strongly alkaline; clear wavy boundary.

2Bk4—33 to 47 inches; white (5YR 8/1) fine sandy loam, pink (5YR 7/4) moist; moderate thick platy structure; very hard, very firm, slightly sticky and nonplastic; few fine and very fine roots; few fine and very fine discontinuous tubular pores; violently effervescent, matrix is impregnated and partially cemented in places with secondary calcium carbonates; strongly alkaline; clear wavy boundary.

2Btkb1—47 to 55 inches; pink (5YR 7/4) fine sandy loam, reddish brown (5YR 5/4) moist; weak very thick platy structure parting to moderate coarse subangular blocky; very hard, firm, slightly sticky

and nonplastic; few fine and very fine roots; few medium and very fine tubular pores; very few thin clay films bridging sand grains; violently effervescent, secondary calcium carbonates segregated as many medium and large irregularly shaped accumulations on faces of peds and in soft masses; strongly alkaline; clear smooth boundary.

2Btkb2—55 to 65 inches; light reddish brown (5YR 6/4) fine sandy loam, reddish brown (5YR 4/4) moist; moderate coarse subangular blocky structure; hard, friable, slightly sticky and nonplastic; few very fine roots; few fine and very fine tubular pores; few thin clay films bridging sand grains, and very few thin clay films on faces of peds; strongly effervescent, secondary calcium carbonates segregated as common fine and medium irregularly shaped accumulations on faces of peds and in soft masses; strongly alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 8 to 18 percent

Depth to calcic horizon: 3 to 15 inches

Reaction: ranges from mildly alkaline in the surface to strongly alkaline in the underlying horizons

A horizon:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 through 6

Rock fragments: 0 to 10 percent pebbles

Upper Bk horizons:

Value: 5 through 7 dry, 4 or 5 moist

Chroma: 4 through 6

Texture: fine sandy loam or very fine sandy loam

Rock fragments: 0 to 5 percent pebbles

Calcium carbonate equivalent: 5 to 40 percent

Lower Bk horizons:

Value: 7 or 8 dry, 5 through 7 moist

Chroma: 4 through 6

Texture: fine sandy loam or loam

Rock fragments: 0 to 5 percent pebbles

Calcium carbonate equivalent: 40 to 60 percent

Btkb horizons:

Value: 6 or 7 dry, 4 or 5 moist

Chroma: 3 through 6

Texture: fine sandy loam or sandy clay loam

Rock fragments: 0 to 5 percent pebbles

Salinity, mmhos/cm: 0 to 2

Sodicity, SAR: 5 to 13

Calcium carbonate equivalent: 10 to 20 percent

Other features: some pedons have texture of clay loam

Moncisco Series

Classification: Loamy-skeletal over fragmental, mixed, mesic Typic Calciorthids

Depth class: Very deep

Drainage class: Excessively drained

Permeability: Moderate in the upper profile and very rapid below

Landform: Footslopes and backslopes of hills

Parent material: Eolian material derived from sandstone and residuum derived from fractured porcelanite

Slope range: 15 to 45 percent

Elevation: 5,600 to 5,900 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Moncisco extremely channery sandy clay loam, in an area of map unit 150—Chipeta-Badland-Moncisco complex, 2 to 45 percent slopes; San Juan County, New Mexico; about 25 miles east-northeast of Sheep Springs; 3,400 feet south and 350 feet east of the northwest corner of sec. 1, T.23N., R.14W.; latitude 36 degrees 15 minutes 13 seconds N and longitude 108 degrees 17 minutes 17 seconds W.

A—0 to 2 inches; pale brown (10YR 6/3) extremely channery sandy clay loam, brown (10YR 4/3) moist; moderate medium platy structure parting to weak fine granular; soft, very friable, slightly sticky and slightly plastic; few fine and very fine roots; common very fine vesicular pores; 70 percent channers and 5 percent pebbles; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk—2 to 11 inches; light reddish brown (5YR 6/3) extremely channery sandy clay loam, reddish brown (5YR 4/4) moist; weak thick platy structure parting to moderate very fine granular; soft, very friable, slightly sticky and slightly plastic; common fine and very fine roots; few very fine irregularly shaped pores; 70 percent channers, 5 percent pebbles, and 5 percent flagstones; violently effervescent, secondary calcium carbonates segregated as many fine and medium irregularly shaped accumulations on rock fragments; moderately alkaline; abrupt wavy boundary.

2Cky—11 to 16 inches; light red (2.5YR 6/6) hard porcelanite fragments, red (2.5YR 4/8) moist; highly fractured platy and angular rock structure; loose; few fine and common very fine roots in cracks; common vertical and horizontal interstices less than 1 mm wide are filled with powdery calcium carbonates and gypsum crystals, few vertical interstices 1 to 3 mm wide lack fine earth; 80 percent channers and 10 percent flagstones; secondary gypsum crystals segregated as very few fine irregularly shaped accumulations on rock fragments; strongly effervescent, secondary calcium carbonates segregated as few fine irregularly shaped accumulations on rock fragments; gradual smooth boundary.

2Cy—16 to 70 inches; red (10R 5/8) hard porcelanite fragments, red (10R 4/8) moist; highly fractured platy and angular rock structure; loose; few fine and very fine roots in cracks; vertical and horizontal interstices lack fine earth; 75 percent channers and 20 percent flagstones; secondary gypsum crystals segregated as very few fine and medium irregularly shaped accumulations on rock fragments.

Range in Characteristics

Depth to calcic horizon: 1 to 5 inches

Depth to fragmental material: 11 to 20 inches

Reaction: ranges from mildly alkaline to moderately alkaline

A horizon:

Value: 5 or 6 dry

Chroma: 3 or 4

Rock fragments: total range is 60 to 75 percent; 0 to 10 percent pebbles,

60 to 70 percent channers less than 3 inches long,

0 to 5 percent flagstones less than 10 inches long

Bk horizon:

Hue: 5YR or 7.5YR

Value: 6 or 7 dry, 4 or 5 moist

Chroma: 2 through 4

Texture: extremely channery sandy clay loam or extremely channery sandy loam

Clay content: 12 to 25 percent

Rock fragments: total range is 70 to 85 percent; 0 to 5 percent pebbles,

65 to 75 percent channers, (10 to 15 percent are longer than 3 inches),

0 to 10 percent flagstones, (0 to 5 percent are longer than 10 inches)

Salinity, mmhos/cm: 4 to 8

Calcium carbonate equivalent: 5 to 20 percent

2C horizons:

Hue: 10R through 5YR

Value: 4 through 7 dry, 4 through 6 moist

Chroma: 4 through 8

Texture: fragmental material

Rock fragments: total range is 90 to 100 percent;

0 to 10 percent pebbles,

60 to 85 percent channers, (10 to 15 percent are longer than 3 inches),

5 to 20 percent angular cobbles or flagstones, (0 to 5 percent are longer than 10 inches),

0 to 5 percent stones

Calcium carbonate equivalent: 0 to 3 percent

Gypsum content: 0 to 2 percent

Nageezi Series

Classification: Coarse-loamy, mixed, mesic Typic Calciorthids

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately rapid

Landform: Treads of high stream terraces and fan terraces

Parent material: Alluvium and eolian material derived from sandstone

Slope range: 1 to 8 percent

Elevation: 4,700 to 5,600 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Nageezi loamy fine sand, in an area of map unit 120—Nageezi-Denazar association, 1 to 8 percent slopes; San Juan County, New Mexico; about 9 miles northeast of Newcomb; 2,300 feet west and 1,600 feet south of the northeast corner of sec. 15, T.25N., R.17W.; latitude 36 degrees 24 minutes 16 seconds N and longitude 108 degrees 38 minutes 16 seconds W.

A—0 to 4 inches; brown (7.5YR 5/4) loamy fine sand, brown (7.5YR 4/4) moist; weak thin platy structure parting to weak fine granular; soft, very friable, nonsticky and nonplastic; few fine and very fine roots; few very fine vesicular pores; slightly effervescent; moderately alkaline; clear smooth boundary.

Bw—4 to 14 inches; brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; moderate

medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few medium and common fine and very fine roots; common very fine tubular pores; 5 percent pebbles; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk1—14 to 18 inches; light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4) moist; weak coarse subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few medium and fine and common very fine roots; few very fine tubular pores; 5 percent pebbles; violently effervescent, secondary calcium carbonates segregated as few fine irregularly shaped accumulations on coarse sand grains and rock fragments; moderately alkaline; clear wavy boundary.

2Bk2—18 to 24 inches; pinkish white (7.5YR 8/2) loam, pink (7.5YR 7/4) moist; moderate thick platy structure; hard, firm, slightly sticky and nonplastic; few fine and common very fine roots; few very fine tubular pores; 5 percent pebbles; violently effervescent, matrix is impregnated with secondary calcium carbonates; moderately alkaline; gradual smooth boundary.

2Bk3—24 to 32 inches; pinkish white (7.5YR 8/2) loam, pink (7.5YR 7/4) moist; weak coarse subangular blocky structure; hard, firm, slightly sticky and nonplastic; few fine and very fine roots; few very fine tubular pores; 5 percent pebbles; violently effervescent, matrix is impregnated with secondary calcium carbonates; strongly alkaline; clear smooth boundary.

2Bk4—32 to 48 inches; very pale brown (10YR 8/3) fine sandy loam, light yellowish brown (10YR 6/4) moist; weak coarse subangular blocky structure; hard, firm, slightly sticky and nonplastic; few very fine roots; few very fine tubular pores; 10 percent pebbles; violently effervescent, secondary calcium carbonates segregated as many fine irregularly shaped accumulations on faces of peds, coarse sand grains, and rock fragments; strongly alkaline; clear wavy boundary.

3Bk5—48 to 56 inches; very pale brown (10YR 7/4) loamy sand, light yellowish brown (10YR 6/4) moist; weak coarse subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; few very fine roots; few very fine tubular pores; 10 percent pebbles; violently

effervescent, secondary calcium carbonates segregated as common fine irregularly shaped accumulations on faces of peds, coarse sand grains, and rock fragments; strongly alkaline; clear wavy boundary.

3Bk6—56 to 64 inches; light yellowish brown (10YR 6/4) loamy coarse sand, yellowish brown (10YR 5/4) moist; weak coarse subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; few fine and very fine roots; few fine tubular pores; 10 percent pebbles; strongly effervescent, secondary calcium carbonates segregated as few fine and medium irregularly shaped accumulations on faces of peds, coarse sand grains, and rock fragments; strongly alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 10 to 18 percent

Depth to base of cambic horizon: 10 to 16 inches

Depth to calcic horizon: 10 to 20 inches

Reaction: ranges from moderately alkaline in the surface and subsoil to strongly alkaline in the substratum

A horizon:

Value: 5 or 6 dry, 4 or 5 moist

Bw horizon:

Value: 5 or 6 dry, 4 or 5 moist

Rock fragments: 0 to 5 percent pebbles

Bk1 horizon:

Value: 6 or 7 dry, 5 or 6 moist

Rock fragments: 0 to 5 percent pebbles

Calcium carbonate equivalent: 10 to 30 percent

2Bk horizons:

Hue: 7.5YR or 10YR

Value: 7 or 8 dry, 6 or 7 moist

Chroma: 2 through 4

Texture: fine sandy loam or loam

Rock fragments: 5 to 10 percent pebbles

Salinity, mmhos/cm: 2 to 8

Sodicity, SAR: 5 to 13

Calcium carbonate equivalent: 15 to 50 percent

3Bk horizons:

Hue: 7.5YR or 10YR

Value: 6 or 7 dry, 5 or 6 moist

Chroma: 2 through 6

Texture: loamy sand or loamy coarse sand

Rock fragments: 5 to 10 percent pebbles

Salinity, mmhos/cm: 4 to 8

Sodicity, SAR: 5 to 13

Calcium carbonate equivalent: 5 to 10 percent

Narbona Series

Classification: Loamy-skeletal, mixed Arenic Eutroboralfs

Depth class: Very deep

Drainage class: Well drained

Permeability: Rapid in the epipedon and moderate in the subsoil

Landform: Ridges of broad, stable landslides, and small landslides of escarpments

Parent material: Colluvium derived from sandstone

Slope range: 15 to 70 percent

Elevation: 7,600 to 9,000 feet

Mean annual precipitation: 16 to 20 inches

Mean annual air temperature: 40 to 43 degrees F.

Frost-free period: 80 to 110 days

Typical Pedon

Narbona very flaggy sand, extremely stony, in an area of map unit 606—Narbona-Deza complex, 5 to 50 percent slopes, San Juan County, New Mexico; about 7.5 miles south of Toadlena; 1,600 feet west and 400 feet north of the southeast corner of sec. 17, T.22N., R.19W.; latitude 36 degrees 8 minutes 5 seconds N and longitude 108 degrees 53 minutes 11 seconds W.

Soil surface is covered by 1 inch of pine needles, twigs, and leaves; abrupt smooth boundary.

A—0 to 4 inches; brown (7.5YR 5/3) very flaggy sand, dark brown (7.5YR 3/3) moist; moderate thick platy structure parting to weak medium granular; soft, very friable, nonsticky and nonplastic; few medium and fine, and many very fine roots; few very fine vesicular pores; 15 percent flagstones, 10 percent cobbles, 10 percent stones, and 5 percent channers; neutral; clear smooth boundary.

E—4 to 14 inches; pinkish gray (7.5YR 7/2) very channery sand, brown (7.5YR 5/3) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few coarse and fine, and common medium and very fine roots; few very fine irregularly shaped pores; 20 percent channers, 10 percent pebbles, 10 percent stones, and 5 percent flagstones; neutral; clear wavy boundary.

E and Bt—14 to 22 inches; pinkish gray (7.5YR 7/2) very channery sand (E part), brown (7.5YR 5/3) moist, with yellowish red (5YR 5/6) loamy sand lamellae (Bt part), yellowish red (5YR 4/6) moist;

weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few coarse, medium, and fine, and common very fine roots; few very fine tubular pores; clay coatings on sand grains in few thin lamellae less than 1 cm thick, totaling less than 1 inch; 20 percent channers, 10 percent pebbles, 10 percent stones, and 5 percent flagstones; neutral; clear wavy boundary.

Bt1—22 to 48 inches; yellowish red (5YR 5/6) very stony sandy clay loam; yellowish red (5YR 4/6) moist; moderate coarse subangular blocky structure; hard, firm, sticky and plastic; few fine and common very fine roots; few very fine tubular pores; few thin clay films on faces of peds and many clay bridges between sand grains; 20 percent stones, 15 percent pebbles, 10 percent channers, and 5 percent cobbles; neutral; gradual wavy boundary.

Bt2—48 to 66 inches; yellowish red (5YR 5/6) very stony sandy loam; yellowish red (5YR 4/6) moist; moderate coarse subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few fine and very fine roots; few very fine tubular pores; few thin clay films on faces of peds and common clay bridges between sand grains; 20 percent stones, 15 percent pebbles, 10 percent channers, and 5 percent cobbles; neutral.

Range in Characteristics

Silicate clay content, control section weighted average: 18 to 30 percent

Rock fragment content, control section weighted average: 35 to 60 percent

Depth to albic horizon: 3 to 5 inches

Depth to loamy subsoil: 20 to 40 inches

Depth to base of argillic horizon: 60 inches or more

A horizon:

Chroma: 2 or 3

Texture: very flaggy sand or very flaggy loamy sand

Rock fragments: total range is 35 to 60 percent; 5 to 10 percent channers (0 to 5 percent are longer than 3 inches),

15 to 25 percent flagstones (5 to 10 percent are longer than 10 inches),

10 to 15 percent cobbles,

5 to 10 percent stones or boulders

E horizon:

Value: 6 or 7 dry, 4 or 5 moist

Chroma: 2 or 3

Texture: very channery sand or very channery loamy sand

Rock fragments: total range is 35 to 60 percent;

5 to 10 percent pebbles,

20 to 30 percent channers (5 to 10 percent are longer than 3 inches),

5 to 10 percent flagstones (0 to 5 percent are longer than 10 inches),

5 to 10 percent stones

E and Bt horizon:

Hue: 5YR or 7.5YR

Value: 6 or 7 dry, 4 or 5 moist

Chroma: 2 through 4

Texture: very channery sand or very channery loamy sand

Rock fragments: total range is 35 to 60 percent;

5 to 10 percent pebbles,

20 to 30 percent channers (5 to 10 percent are longer than 3 inches),

5 to 10 percent flagstones (0 to 5 percent are longer than 10 inches),

5 to 10 percent stones

Other features: few thin lamellae less than 1 cm thick, totaling less than 1 inch, which have dry value of 5 and chroma as high as 6

Bt horizons:

Hue: 5YR or 7.5YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 through 6

Texture: very stony sandy clay loam or very stony sandy loam

Rock fragments: total range is 35 to 60 percent;

10 to 15 percent pebbles,

5 to 10 percent channers (0 to 5 percent are longer than 3 inches),

5 to 10 percent cobbles,

15 to 25 percent stones

Nataani Series

Classification: Coarse-silty, mixed, mesic Cambic Gypsiorthids

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Moderate

Landform: Toeslopes of undulating plateaus

Parent material: Alluvium and residuum derived from siltstone and sandstone

Slope range: 1 to 5 percent

Elevation: 5,000 to 5,600 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Nataani very fine sandy loam, in an area of map unit 250—Littlehat-Persayo-Nataani complex, 0 to 15 percent slopes; San Juan County, New Mexico; about 6 miles south of Shiprock; 2,650 feet east and 450 feet south of the northwest corner of sec. 30, T.29N., R.17W.; latitude 36 degrees 42 minutes 14 seconds N and longitude 108 degrees 40 minutes 23 seconds W.

A—0 to 3 inches; light yellowish brown (10YR 6/4) very fine sandy loam, yellowish brown (10YR 5/4) moist; moderate thick platy structure parting to weak very fine granular; soft, very friable, slightly sticky and nonplastic; few fine and very fine roots; common very fine vesicular pores; 2 percent fine pebbles; violently effervescent; mildly alkaline; clear smooth boundary.

2Bw—3 to 9 inches; light yellowish brown (2.5Y 6/4) loam, light olive brown (2.5Y 5/4) moist; moderate coarse subangular blocky structure; soft, very friable; slightly sticky and slightly plastic; few fine and common very fine roots; common very fine continuous tubular pores; violently effervescent; secondary calcium carbonates segregated in few fine irregularly shaped filaments; moderately alkaline; abrupt smooth boundary.

3By—9 to 15 inches; light gray (2.5Y 7/2) gypsiferous material which is an apparent silt loam, light yellowish brown (2.5Y 6/4) moist; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few fine and very fine roots; few very fine continuous tubular pores; secondary silt-sized gypsum crystals segregated in many fine irregularly shaped filaments, few coarse sand-sized primary gypsum crystals; strongly effervescent; mildly alkaline; clear wavy boundary.

3BCy—15 to 21 inches; light yellowish brown (2.5Y 6/4) gypsiferous material which is an apparent silt loam, light olive brown (2.5Y 5/4) moist; weak coarse subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few fine and common very fine roots; few very fine discontinuous tubular pores; secondary silt-sized gypsum crystals segregated in common fine irregularly shaped filaments, few coarse sand-sized gypsum crystals; slightly effervescent; moderately alkaline; clear wavy boundary.

4C—21 to 30 inches; light yellowish brown (2.5Y 6/4) silt loam, light olive brown (2.5Y 5/4) moist; massive, platy rock structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and common very fine roots; few very fine discontinuous irregularly shaped pores; 5 percent soft siltstone fragments; secondary silt-sized gypsum crystals segregated as few fine irregularly shaped filaments on undersides of fragments, few coarse sand-sized primary gypsum crystals in soft masses; slightly effervescent; moderately alkaline; clear wavy boundary.

4Cr—30 inches; thinly interbedded siltstone and very fine grained soft sandstone bedrock.

Range in Characteristics

Soil depth: 20 to 40 inches

Silicate clay content, control section weighted average: 10 to 18 percent

Rock fragment content, control section weighted average: 0 to 5 percent pebbles

Depth to gypsic horizon: 8 to 15 inches

Calcium carbonate equivalent: 5 to 15 percent

Reaction: ranges from mildly alkaline to moderately alkaline

A horizon:

Value: 4 or 5 moist

Chroma: 3 or 4

Bw horizon:

Hue: 10YR or 2.5Y

Chroma: 2 through 4

Texture: loam or very fine sandy loam

Salinity, mmhos/cm: 2 to 4

Sodicity, SAR: 0 to 5

By and BCy horizons:

Hue: 10YR or 2.5Y

Value: 6 or 7 dry, 5 or 6 moist

Chroma: 2 through 4

Texture: gypsiferous material which is an apparent silt loam or very fine sandy loam

Salinity, mmhos/cm: 2 to 16

Sodicity, SAR: 0 to 13

Gypsum content: 15 to 45 percent

Other features: 0 to 20 percent soft siltstone fragments

C horizons:

Value: 6 or 7 dry

Chroma: 2 through 4

Texture: silt loam or very fine sandy loam

Salinity, mmhos/cm: 8 to 16

Sodicity, SAR: 5 to 13

Gypsum content: 1 to 5 percent
Other features: 5 to 40 percent soft siltstone fragments

Needle Series

Classification: Mixed, mesic Lithic Torripsamments
Depth class: Shallow
Drainage class: Excessively drained
Permeability: Rapid
Landform: Summits of structural benches
Parent material: Eolian material derived from sandstone
Slope range: 2 to 20 percent
Elevation: 4,700 to 5,500 feet
Mean annual precipitation: 5 to 8 inches
Mean annual air temperature: 54 to 56 degrees F.
Frost-free period: 150 to 170 days

Typical Pedon

Needle fine sand, in an area of map unit 520—Rock outcrop-Needle complex, 2 to 20 percent slopes; Apache County, Arizona; about 4.5 miles northwest of Totacon (Sweetwater community); 1,600 feet north and 350 feet east of the southwest corner of sec. 7, T.40N., R.27E.; latitude 36 degrees 53 minutes 11 seconds N and longitude 109 degrees 29 minutes 49 seconds W.

A—0 to 5 inches; reddish yellow (5YR 6/6) fine sand, yellowish red (5YR 4/6) moist; moderate very thick platy structure parting to weak medium granular; soft, very friable, nonsticky and nonplastic; few medium and fine, and common very fine roots; mildly alkaline; clear smooth boundary.

C1—5 to 13 inches; reddish yellow (5YR 6/6) fine sand, yellowish red (5YR 4/6) moist; single grain; loose, nonsticky and nonplastic; common coarse and very fine, and few medium and fine roots; very slightly effervescent; mildly alkaline; clear smooth boundary.

C2—13 to 15 inches; yellowish red (5YR 5/8) fine sand, yellowish red (5YR 4/6) moist; single grain; loose, nonsticky and nonplastic; few very fine to medium and common coarse roots; non-effervescent to strongly effervescent in spots, secondary calcium carbonates segregated as very few fine irregularly shaped accumulations on sand grains; mildly alkaline; abrupt wavy boundary.

2R—15 inches; sandstone bedrock.

Range in Characteristics

Soil depth: 10 to 20 inches
Silicate clay content, control section weighted average: 2 to 8 percent

A horizon:

Value: 5 or 6 dry

C horizons:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 through 8

Texture: fine sand or loamy fine sand

Nizhoni Series

Classification: Loamy, mixed (calcareous), mesic Lithic Ustorthents
Depth class: Very shallow
Drainage class: Well drained
Permeability: Moderately rapid
Landform: Dipslopes of cuestas, and summits of mesas and structural benches
Parent material: Eolian material and residuum derived from sandstone
Slope range: 2 to 20 percent
Elevation: 6,200 to 7,600 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 48 to 50 degrees F.
Frost-free period: 120 to 140 days

Typical Pedon

Nizhoni very fine sandy loam, in an area of map unit 406—Rock outcrop-Nizhoni complex, 8 to 20 percent slopes; Apache County, Arizona; about 8 miles north of Cove; 1,900 feet west and 325 feet north of the southeast corner of sec. 22, T.38N., R.29E.; latitude 36 degrees 40 minutes 48 seconds N and longitude 109 degrees 13 minutes 2 seconds W.

A—0 to 3 inches; yellowish red (5YR 5/6) very fine sandy loam, yellowish red (5YR 4/6) moist; moderate very coarse platy structure parting to weak fine granular; slightly hard, very friable, nonsticky and nonplastic; common very fine and few fine roots; common very fine irregularly shaped pores; well developed black cryptogam crust on the soil surface; strongly effervescent; moderately alkaline; clear smooth boundary.

2C1—3 to 6 inches; red (2.5YR 5/6) fine sandy loam, red (2.5YR 4/6) moist; massive; soft, very friable, nonsticky and nonplastic; common coarse and few medium and very fine roots; few very fine tubular pores; 15 percent soft sandstone

fragments; strongly effervescent; moderately alkaline; abrupt smooth boundary.

2C2—6 to 7 inches; dark reddish gray (5YR 4/2) fine sandy loam, dark reddish brown (5YR 3/2) moist; massive; soft, very friable, nonsticky and nonplastic; common medium and few coarse and fine roots; 5 percent soft sandstone fragments; strongly effervescent; moderately alkaline; abrupt smooth boundary.

2R—7 inches; sandstone bedrock.

Range in Characteristics

Soil depth: 4 to 10 inches

Silicate clay content, control section weighted average: 10 to 18 percent

Reaction: ranges from mildly alkaline to moderately alkaline

A horizon:

Hue: 2.5YR or 5YR

Value: 5 or 6 dry

Chroma: 4 or 6

C horizons:

Hue: 2.5YR or 5YR

Value: 4 through 6 dry, 3 or 4 moist

Chroma: 2 through 8, dry or moist

Texture: fine sandy loam or very fine sandy loam

Other features: 0 to 15 percent soft sandstone fragments

Nomrah Series

Classification: Fine-loamy, mixed, mesic Aridic Haplustalfs

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Footslopes of stable landslides

Parent material: Eolian material and alluvium derived from sandstone

Slope range: 2 to 10 percent

Elevation: 6,800 to 7,800 feet

Mean annual precipitation: 12 to 16 inches

Mean annual air temperature: 48 to 50 degrees F.

Frost-free period: 120 to 140 days

Typical Pedon

Nomrah fine sandy loam, in an area of map unit 407—Iwela-Nomrah-Vosburg complex, 1 to 40 percent slopes; San Juan County, New Mexico; about 6 miles southwest of Sheep Springs; 1,000 feet north and 1,150 feet east of the southwest corner of sec. 30, T.22N., R.18W.; latitude 36 degrees 6 minutes 25

seconds N and longitude 108 degrees 48 minutes 18 seconds W.

A—0 to 3 inches; dark brown (7.5YR 4/2) fine sandy loam, dark brown (7.5YR 3/2) moist; moderate very thick platy structure parting to moderate medium granular; slightly hard, very friable, slightly sticky and nonplastic; few fine and common very fine roots; few very fine irregularly shaped pores; neutral; clear smooth boundary.

Bt1—3 to 8 inches; brown (7.5YR 4/3) sandy clay loam, dark brown (7.5YR 3/3) moist; weak thick platy structure parting to moderate coarse subangular blocky; hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; few fine and very fine tubular pores; very few thin clay films on faces of pedis and lining pores, and few thin clay films bridging sand grains; neutral; gradual smooth boundary.

Bt2—8 to 23 inches; brown (7.5YR 5/4) sandy clay loam, dark brown (7.5YR 3/4) moist; moderate coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few coarse and medium, and common fine and very fine roots; few fine and very fine tubular pores; few thin clay films on faces of pedis and lining pores; neutral; clear smooth boundary.

Bt3—23 to 32 inches; yellowish red (5YR 5/6) sandy clay loam, reddish brown (5YR 4/4) moist; weak medium prismatic structure parting to moderate coarse angular blocky; hard, firm, sticky and plastic; common fine and few medium and very fine roots; few medium to very fine tubular pores; few thin and moderately thick clay films on faces of pedis and lining pores; 5 percent pebbles; non-effervescent to very slightly effervescent in spots, secondary calcium carbonates segregated as very few fine filaments; neutral; clear wavy boundary.

Btk1—32 to 43 inches; light reddish brown (5YR 6/4) sandy clay loam, reddish brown (5YR 5/4) moist; moderate coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few medium to very fine roots; few medium and fine and common very fine tubular pores; very few thin clay films on faces of pedis; 5 percent pebbles; violently effervescent, secondary calcium carbonates segregated as many fine and medium irregularly shaped accumulations on faces of pedis and on rock fragments; moderately alkaline; gradual smooth boundary.

Btk2—43 to 58 inches; light reddish brown (5YR 6/4)

sandy clay loam, reddish brown (5YR 5/4) moist; moderate coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; few fine and common very fine tubular pores; very few thin clay films on faces of peds; 10 percent pebbles; violently effervescent, secondary calcium carbonates segregated as many fine and medium irregularly shaped accumulations on faces of peds and on rock fragments; moderately alkaline; clear wavy boundary.

BC—58 to 62 inches; strong brown (7.5YR 5/6) fine sandy loam, strong brown (7.5YR 4/6) moist; weak coarse subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; few fine and very fine roots; few fine and very fine tubular pores; 5 percent pebbles; very slightly effervescent, secondary calcium carbonates segregated as very few fine irregularly shaped accumulations on rock fragments; mildly alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 20 to 35 percent

Depth to base of argillic horizon: 40 to 60 inches

Depth to calcic horizon: 25 to 40 inches

Reaction: ranges from neutral in the surface to moderately alkaline in the lower subsoil

A horizon:

Hue: 5YR or 7.5YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 2 or 3

Bt horizons:

Hue: 5YR or 7.5YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 through 6

Rock fragments: 0 to 5 percent pebbles

Btk and Bk horizons:

Hue: 5YR or 7.5YR

Value: 6 through 8 dry, 5 through 7 moist

Chroma: 2 through 4

Texture: sandy clay loam or fine sandy loam

Rock fragments: 0 to 10 percent pebbles

Calcium carbonate equivalent: 15 to 30 percent

BC horizon:

Hue: 5YR or 7.5YR

Value: 5 through 7 dry, 4 or 5 moist

Chroma: 2 through 6

Rock fragments: 0 to 5 percent pebbles

Calcium carbonate equivalent: 1 to 5 percent

Notal Series

Classification: Fine, mixed (calcareous), mesic Typic Torriorthents

Depth class: Very deep

Drainage class: Well drained

Permeability: Very slow

Landform: Low stream terraces and fan terraces

Parent material: Alluvium derived from shale, siltstone, and sandstone

Slope range: 0 to 5 percent

Elevation: 4,700 to 6,100 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Notal silty clay loam, in an area of map unit 160—Notal-Escavada-Riverwash association, 0 to 1 percent slopes; San Juan County, New Mexico; about 9 miles east of Sheep Springs near the Great Bend of the Chaco River; 1,000 feet east and 1,000 feet south of the northwest corner of sec. 3, T.22N., R.16W.; latitude 36 degrees 10 minutes 27 seconds N and longitude 108 degrees 9 minutes 46 seconds W.

A—0 to 3 inches; pale brown (10YR 6/3) silty clay loam, dark brown (10YR 4/2) moist; moderate thick platy structure parting to strong very fine granular; soft, very friable, sticky and plastic; few fine and very fine roots; few very fine vesicular pores; slightly effervescent; strongly alkaline; clear smooth boundary.

Bw—3 to 11 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate coarse subangular blocky structure; hard, friable, sticky and plastic; few medium and common fine and very fine roots; few very fine tubular pores; secondary gypsum segregated as very few fine filaments; slightly effervescent; strongly alkaline; clear smooth boundary.

BCy—11 to 27 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; weak very thick platy structure parting to moderate coarse subangular blocky; hard, firm, sticky and plastic; few medium and common fine and very fine roots; few very fine tubular pores; few thin strata of silt loam; secondary gypsum segregated as common fine irregularly shaped filaments; slightly effervescent; strongly alkaline; clear wavy boundary.

Cy—27 to 70 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist;

massive; very hard, firm, sticky and plastic; few medium and very fine roots; common thin strata of silt loam and very fine sandy loam; secondary gypsum segregated as few fine and medium irregularly shaped masses and filaments; slightly effervescent; strongly alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 35 to 55 percent

Reaction: ranges from moderately alkaline to strongly alkaline

Flooding frequency: none to rare

A horizon:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 or 3

Texture: silty clay loam, clay loam, or sandy clay loam

Salinity, mmhos/cm: 2 to 8

Sodicity, SAR: 5 to 13

Bw horizon:

Chroma: 2 or 3

Texture: silty clay loam, silty clay, or clay

Salinity, mmhos/cm: 4 to 8

Sodicity, SAR: 5 to 13

Calcium carbonate equivalent: 5 to 10 percent

Gypsum content: 0 to 1 percent

BCy and Cy horizons:

Hue: 10YR or 2.5Y

Chroma: 2 or 3

Texture: stratified sandy clay loam to silty clay

Rock fragments: 0 to 10 percent pebbles

Salinity, mmhos/cm: 4 to 16

Sodicity, SAR: 13 to 30

Calcium carbonate equivalent: 5 to 10 percent

Gypsum content: 1 to 5 percent

Other features: most pedons have thin strata of silt loam, very fine sandy loam, sandy clay loam, or loam

Outpost Series

Classification: Clayey over loamy, mixed (calcareous), mesic Vertic Torrifluvents

Depth class: Very deep

Drainage class: Well drained

Permeability: Slow in the upper part and moderate in the lower part

Landform: Flood plains

Parent material: Alluvium derived from sandstone and shale

Slope range: 0 to 2 percent

Elevation: 5,000 to 6,000 feet

Mean annual precipitation: 6 to 8 inches

Mean annual air temperature: 52 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Outpost sandy clay loam, in an area of map unit 527—Outpost sandy clay loam, 0 to 2 percent slopes; Apache County, Arizona; about 7.5 miles south-southwest of Rock Point; 1,850 feet east and 1,200 feet south of the northwest corner of sec. 18, T.37N., R.25E.; latitude 36 degrees 27 minutes 6 seconds N and longitude 109 degrees 41 minutes 30 seconds W.

AC—0 to 3 inches; pale brown (10YR 6/3) with reddish yellow (5YR 6/6) sandy clay loam, brown (10YR 4/3) with yellowish red (5YR 4/6) moist; moderate very thick platy structure parting to weak coarse granular; soft, very friable, sticky and slightly plastic; few fine and very fine roots; few fine and very fine irregularly shaped pores; few laminae and thin lenses of silt loam; few thin cracks 2 to 5 mm wide; strongly effervescent; moderately alkaline; clear smooth boundary.

C1—3 to 11 inches; pale brown (10YR 6/3) with reddish yellow (5YR 6/6) clay loam; brown (10YR 4/3) with yellowish red (5YR 4/6) moist; weak coarse subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine roots; few fine tubular pores; few laminae and thin lenses of silt loam; few thin cracks 2 to 5 mm wide; secondary very fine sand-sized gypsum crystals segregated in very few fine filaments; strongly effervescent; strongly alkaline; gradual smooth boundary.

C2—11 to 19 inches; pale brown (10YR 6/3) with reddish yellow (7.5YR 6/6) silty clay, brown (10YR 4/3) with strong brown (7.5YR 4/6) moist; weak coarse subangular blocky structure; very hard, firm, very sticky and very plastic; common very fine roots; few very fine tubular pores; few laminae of silt loam and very fine sandy loam; common pressure faces (stress cutans); few thin cracks 5 to 10 mm wide; secondary very fine sand-sized gypsum crystals segregated in very few fine filaments; strongly effervescent; strongly alkaline; clear wavy boundary.

Cyss1—19 to 27 inches; pale brown (10YR 6/3) with light brown (7.5YR 6/4) silty clay, brown (10YR 4/3 with 7.5YR 4/4) moist; moderate medium subangular blocky structure; very hard, firm, very sticky and very plastic; common very fine roots; few fine and very fine tubular pores; few

thin lenses of silt loam; few intersecting slickensides; few thin cracks 5 to 10 mm wide; secondary very fine sand-sized gypsum crystals segregated in few fine filaments; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cy2—27 to 35 inches; light grayish brown (10YR 6/2) with light brown (7.5YR 6/4) silty clay, grayish brown (10YR 4/2) with brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; very hard, firm, very sticky and very plastic; few very fine roots; few very fine tubular pores; few thin lenses of silt loam; few intersecting slickensides; very few thin cracks 2 to 5 mm wide; secondary very fine sand-sized gypsum crystals segregated in common fine filaments; strongly effervescent; moderately alkaline; abrupt wavy boundary.

2C1—35 to 49 inches; pale brown (10YR 6/3) with light brown (7.5YR 6/4) sandy loam, brown (10YR 4/3) with dark brown (7.5YR 4/4) moist; weak coarse subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few very fine roots; few fine and very fine tubular pores; few strata of fine sandy loam; secondary very fine sand-sized gypsum crystals segregated in very few fine filaments; strongly effervescent; mildly alkaline; clear smooth boundary.

2C2—49 to 58 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, slightly sticky and nonplastic; few very fine roots; few very fine tubular pores; few strata of sandy loam and few laminae of silt loam; secondary very fine sand-sized gypsum crystals segregated in very few fine filaments; strongly effervescent; mildly alkaline; clear smooth boundary.

2C3—58 to 80 inches; pale brown (10YR 6/3) loamy sand, brown (10YR 5/3) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; few strata of fine sandy loam and few laminae of silty clay loam; secondary very fine sand-sized gypsum crystals segregated in few fine filaments in silty strata; strongly effervescent; mildly alkaline.

Range in Characteristics

Depth to major lithologic discontinuity of loamy material: 18 to 35 inches

Silicate clay content, control section weighted average: 35 to 60 percent in upper part and 8 to 15 percent in lower part

Reaction: ranges from moderately alkaline to strongly alkaline in the upper part and mildly alkaline to moderately alkaline in the lower part

AC horizon:

Hue: 5YR through 10YR

Value: 5 or 6 dry, 3 through 5 moist

Chroma: 3 through 6

Salinity, mmhos/cm: 0 to 2

C horizons:

Hue: 5YR through 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 through 6

Texture: clay loam, silty clay loam, or silty clay

Salinity, mmhos/cm: 2 to 8

Gypsum content: 1 to 5 percent

Upper 2C horizons:

Hue: 5YR through 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 through 6

Texture: stratified sandy loam to silt loam

Salinity, mmhos/cm: 4 to 8

Gypsum content: 0 to 1 percent

Lower 2C horizon:

Hue: 5YR through 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 through 6

Texture: stratified loamy sand to silty clay loam

Clay content: 15 to 25 percent

Salinity, mmhos/cm: 4 to 8

Gypsum content: 0 to 1 percent

Owlspring Series

Classification: Fine-silty, mixed Pachic Argiborolls

Depth class: Very deep

Drainage class: Somewhat poorly drained

Permeability: Moderately slow

Landform: Toeslopes of calderas and mesas

Parent material: Alluvium and residuum derived from basalt and basaltic tuff

Slope range: 1 to 10 percent

Elevation: 8,500 to 9,000 feet

Mean annual precipitation: 20 to 22 inches

Mean annual air temperature: 40 to 42 degrees F.

Frost-free period: 80 to 100 days

Typical Pedon

Owlspring loam, in an area of map unit 706—Todacheene-Viewpoint-Owlspring association, 1 to 20 percent slopes; San Juan County, New Mexico; about 9.5 miles west of Sheep Springs; 2,650 feet west and 1,150 feet north of the southeast corner of sec. 28,

T.22N., R.19W; latitude 36 degrees 6 minutes 27 seconds N and longitude 108 degrees 52 minutes 18 seconds W.

A—0 to 5 inches; dark brown (7.5YR 4/2) loam, very dark brown (7.5YR 2/2) moist; common fine distinct dark yellowish brown (10YR 4/4) redox concentrations near root channels; weak thick platy structure parting to moderate fine granular; soft, very friable, slightly sticky and nonplastic; few fine and common very fine roots; few very fine irregularly shaped pores; 5 percent pebbles; slightly acid; abrupt smooth boundary.

Bt1—5 to 10 inches; dark reddish brown (5YR 3/2) loam, black (5YR 2.5/1) moist; common fine distinct brown (7.5YR 4/4) redox concentrations near root channels; strong coarse prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; few medium, few fine, and common very fine roots; common very fine tubular pores; few thin clay films on faces of ped and lining pores; slightly acid; clear wavy boundary.

Bt2—10 to 18 inches; very dark gray (5YR 3/1) loam, black (5YR 2.5/1) moist; strong medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; few fine and common very fine roots; few fine and many very fine tubular pores; common thin clay films on faces of ped and lining pores; slightly acid; clear smooth boundary.

Bt3—18 to 25 inches; very dark gray (5YR 3/1) clay loam, black (5YR 2.5/1) moist; moderate fine prismatic structure parting to weak medium subangular blocky; hard, firm, sticky and plastic; few fine and few very fine roots; few fine and many very fine tubular pores; few moderately thick and common thin clay films on faces of ped and lining pores; neutral; clear smooth boundary.

Btb—25 to 31 inches; dark reddish gray (5YR 4/2) sandy clay loam, very dark gray (5YR 3/2) moist; few fine prominent yellowish red (5YR 4/6) redox concentrations; weak fine prismatic structure parting to strong medium angular blocky; hard, firm, sticky and plastic; few fine and few very fine roots; few fine and common very fine tubular pores; many moderately thick clay films on faces of ped; neutral; clear wavy boundary.

Btgb—31 to 43 inches; pinkish gray (7.5YR 6/2)

sandy clay loam, brown (7.5YR 4/2) moist; common medium prominent yellowish red (5YR 4/6) redox concentrations; moderate medium prismatic structure parting to weak coarse subangular blocky; hard, firm, slightly sticky and slightly plastic; few very fine roots; few fine and common very fine tubular pores; 1 inch thick lense of charcoal at 32 inches; common moderately thick and few thin clay films on faces of ped; neutral; gradual smooth boundary.

BCTb—43 to 66 inches; brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; common fine prominent strong brown (7.5YR 4/6) redox concentrations; weak coarse prismatic structure parting to moderate coarse subangular blocky; slightly hard, friable, slightly sticky and nonplastic; few very fine roots; few medium and fine and common very fine tubular pores; common thin clay films on faces of ped; 5 percent pebbles; neutral; abrupt wavy boundary.

C1—66 to 72 inches; pale brown (10YR 6/3) gravelly sandy loam, (10YR 4/3) moist; common fine prominent yellowish brown (10YR 5/8) redox concentrations; weak fine subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few very fine roots; few very fine tubular pores; 25 percent pebbles and 5 percent cobbles; neutral; abrupt wavy boundary.

2C2—72 to 81 inches; light brownish gray (2.5Y 6/2) with strong brown (7.5YR 5/6) very fine sandy loam, dark grayish brown (2.5Y 4/2) with strong brown (7.5YR 4/6) moist; common medium prominent gray (10YR 5/1) redox depletions and common fine prominent yellowish red (5YR 4/6) redox concentrations; massive; soft, friable, slightly sticky and nonplastic; few very fine roots; few fine and common very fine tubular pores; 10 percent soft tuff fragments; neutral; clear smooth boundary.

2Cr—81 inches; soft, basaltic tuff bedrock.

Range in Characteristics

Silicate clay content, control section weighted average: 20 to 27 percent

Depth to base of mollic epipedon and top of buried soil: 19 to 38 inches

Depth of top of argillic horizon: 2 to 7 inches

Depth to redoximorphic features: 0 to 20 inches

Reaction: ranges from slightly acid in the surface to neutral in the subsoil and substratum

Depth to seasonal high water table: 2.0 to 3.5 feet

A horizon:*Hue:* 7.5YR, 10YR, or N (neutral)*Value:* 3 or 4 dry, 2 or 3 moist*Chroma:* 0 through 3*Rock fragments:* 0 to 5 percent pebbles*Redoximorphic features:* none to common, fine, faint to distinct, brown, strong brown, or dark yellowish brown redox concentrations**Bt horizon:***Hue:* 5YR, 7.5YR, or N*Value:* 3 or 4 dry, 2 or 3 moist*Chroma:* 0 through 2*Texture:* loam or clay loam*Clay content:* 20 to 35 percent*Rock fragments:* 0 to 5 percent pebbles*Redoximorphic features:* none to common, fine, faint to distinct, brown, strong brown, or dark yellowish brown redox concentrations, usually in upper horizons**Btb horizon:***Hue:* 5YR or 7.5YR*Value:* 4 through 6 dry, 3 or 4 moist*Chroma:* 2 through 4*Clay content:* 20 to 35 percent*Rock fragments:* total range is 0 to 10 percent;

0 to 5 percent pebbles,

0 to 5 percent cobbles

Redoximorphic features: few to common, fine to medium, distinct or prominent, brown, strong brown, or yellowish red redox concentrations; strong gleying marked by matrix chromas of 1 or 2, are present in some pedons**BCtb horizon:***Hue:* 7.5YR or 10YR*Value:* 5 or 6 dry, 4 or 5 moist*Chroma:* 2 through 4*Texture:* fine sandy loam or sandy loam*Clay content:* 16 to 20 percent*Rock fragments:* total range is 5 to 15 percent;

5 to 10 percent pebbles,

0 to 5 percent cobbles

Redoximorphic features: few to common, fine to medium, distinct or prominent, yellowish brown, brown, or strong brown redox concentrations, and grayish brown redox depletions**C1 horizon:***Hue:* 7.5YR or 10YR*Value:* 5 or 6 dry, 4 or 5 moist*Chroma:* 3 or 4*Texture:* gravelly sandy loam or gravelly fine sandy loam*Clay content:* 8 to 18 percent*Rock fragments:* total range is 15 to 35 percent;

10 to 25 percent pebbles,

0 to 10 percent cobbles

Redoximorphic features: few to common, fine to medium, distinct or prominent, yellowish brown, brown, or strong brown redox concentrations**2C2 horizon:***Hue:* 10YR or 2.5Y*Value:* 5 or 6 dry*Chroma:* 2 through 6*Texture:* very fine sandy loam or fine sandy loam*Clay content:* 8 to 18 percent*Redoximorphic features:* common, fine to medium, prominent, brownish yellow or yellowish red redox concentrations, and grayish brown or gray redox depletions*Other features:* 10 to 30 percent soft tuff fragments**Pastorpeak Series***Classification:* Loamy-skeletal, mixed Pachic Argiborolls*Depth class:* Very deep*Drainage class:* Well drained*Permeability:* Moderate in the subsoil and very rapid in the substratum*Landform:* Backslopes of mountains*Parent material:* Colluvium and residuum derived from quartz diorite and sandstone*Slope range:* 50 to 95 percent*Elevation:* 7,500 to 9,000 feet*Mean annual precipitation:* 14 to 18 inches*Mean annual air temperature:* 42 to 45 degrees F.*Frost-free period:* 100 to 120 days**Typical Pedon**

Pastorpeak very cobbly very fine sandy loam, extremely stony, in an area of map unit 616—Ligai-Pastorpeak-Rock outcrop complex, 35 to 95 percent slopes; Apache County, Arizona; about 7.5 miles southwest of Teec Nos Pos; 275 feet west and 675 feet south of the northeast corner of sec. 36, T.40N., R.29E.; latitude 36 degrees 50 minutes 13 seconds N and longitude 109 degrees 10 minutes 33 seconds W. Soil surface is covered by 2 inches of slightly decomposed fir needles, twigs, and cones; abrupt smooth boundary.

A—0 to 4 inches; dark reddish gray (5YR 4/2) very cobbly very fine sandy loam, dark reddish gray (5YR 3/2) moist; weak thick platy structure parting to moderate medium granular; soft, very friable, slightly sticky and nonplastic; common medium, fine, and very fine roots; common very

fine irregularly shaped pores; 25 percent cobbles, 10 percent flagstones, 10 percent channers, 5 percent stones, and 2 percent boulders; slightly acid; clear smooth boundary.

Bt1—4 to 21 inches; reddish brown (5YR 4/3) very cobbly loam, dark reddish brown (5YR 3/3) moist; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few coarse, many medium, and common fine and very fine roots; few fine and very fine tubular pores; common thin clay films on faces of peds and lining pores; 25 percent cobbles, 15 percent channers, and 5 percent flagstones; neutral; gradual wavy boundary.

Bt2—21 to 38 inches; reddish brown (5YR 4/3) very cobbly loam, dark reddish brown (5YR 3/3) moist; moderate medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; few coarse and common medium, fine, and very fine roots; common thin clay films on faces of peds and on rock fragments; 30 percent cobbles, 10 percent flagstones, 10 percent channers, and 5 percent stones; neutral; clear wavy boundary.

Btk—38 to 64 inches; reddish brown (5YR 5/4) extremely cobbly sandy loam, reddish brown (5YR 4/4) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; few coarse and medium, many fine, and common very fine roots; common thin clay films on rock fragments; 35 percent cobbles, 15 percent flagstones, 10 percent channers, 10 percent pebbles, and 5 percent stones; noneffervescent in fine earth, strongly effervescent on undersides of larger rock fragments where secondary calcium carbonates are segregated in common large irregularly shaped accumulations; mildly alkaline; clear irregular boundary.

Ctk—64 to 80 inches; angular quartz diorite fragments, separated by fractures wider than 1 cm which are devoid of fine earth, with some reddish brown (5YR 5/4) sandy loam present in fractures less than 1 cm wide, reddish brown (5YR 4/4) moist; massive, rock structure dominant except for minor amounts of granular fine earth; few fine and very fine roots; very few thin clay films on rock fragments; 45 percent flagstones, 20 percent cobbles, 15 percent channers, and 5 percent stones; very slightly effervescent in fine earth, violently effervescent on undersides of larger rock fragments where

secondary calcium carbonates are segregated in common large irregularly shaped accumulations; moderately alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 18 to 27 percent

Rock fragments, control section weighted average: 35 to 60 percent

Depth to base of mollic epipedon: 16 to 38 inches

Depth to base of argillic horizon: 50 to 60 inches or more

Depth to fragmental material: 60 to 80 inches

Reaction: ranges from slightly acid in the surface to moderately alkaline in the substratum

A horizon:

Hue: 5YR or 7.5YR

Value: 4 or 5 dry

Chroma: 2 or 3

Rock fragments: total range is 35 to 60 percent;

5 to 15 percent pebbles and channers (less than 3 inches long,

25 to 30 percent cobbles and flagstones (less than 10 inches long),

5 to 10 percent stones

0 to 5 percent boulders

Bt horizons:

Hue: 5YR or 7.5YR

Value: 4 or 5 dry

Chroma: 2 or 3

Texture: very cobbly loam or very cobbly sandy clay loam

Rock fragments: total range is 35 to 60 percent;

10 to 20 percent pebbles and channers (less than 3 inches long),

25 to 35 percent cobbles and flagstones (less than 10 inches long),

0 to 5 percent stones

Btk horizon:

Hue: 5YR or 7.5YR

Chroma: 2 through 6

Texture: extremely cobbly sandy loam or extremely cobbly loam

Rock fragments: total range is 60 to 80 percent;

15 to 20 percent pebbles and channers (less than 3 inches long),

40 to 50 percent cobbles and flagstones (less than 10 inches long),

5 to 10 percent stones

Calcium carbonate equivalent: 1 to 3 percent

Ctk horizon:

Hue: 5YR or 7.5YR

Chroma: 2 through 6

Texture: fragmental material

Rock fragments: total range is 80 to 95 percent; 20 to 25 percent pebbles and channers (less than 3 inches long), 55 to 60 percent cobbles and flagstones (less than 10 inches long), 5 to 10 percent stones
Calcium carbonate equivalent: 1 to 3 percent

Patel Series

Classification: Fine, mixed, mesic Typic Natrargids

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Slow

Landform: Footslopes below structural benches and cuestas

Parent material: Alluvium and residuum derived from shale, siltstone, and limestone

Slope range: 5 to 25 percent

Elevation: 4,800 to 5,400 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Patel very channery loam, in an area of map unit 137—Persayo-Cairn-Patel complex, 1 to 25 percent slopes; San Juan County, New Mexico; about 16 miles northwest of Shiprock; 1,250 feet west and 1,700 feet south of the northeast corner of sec. 31, T.32N., R.19W.; latitude 36 degrees 56 minutes 47 seconds N and longitude 108 degrees 53 minutes 7 seconds W.

E—0 to 1 inch; light brown (7.5YR 6/4) very channery loam, brown (7.5YR 4/4) moist; moderate very thick platy structure; soft, very friable, slightly sticky and slightly plastic; few very fine roots; few fine and common very fine vesicular pores; 30 percent channers and 10 percent pebbles; strongly effervescent; moderately alkaline; abrupt smooth boundary.

2Btn—1 to 8 inches; brown (7.5YR 5/4) clay, brown (7.5YR 4/4) moist; moderate medium prismatic structure parting to strong fine angular blocky; hard, firm, sticky and plastic; few very fine roots; many very fine irregularly shaped pores; common thin clay films on faces of peds and lining pores; 5 percent channers and 5 percent pebbles; strongly effervescent; strongly alkaline; clear smooth boundary.

3Btkn—8 to 14 inches; yellowish brown (10YR 5/4)

silty clay loam, dark yellowish brown (10YR 4/4) moist; strong medium prismatic structure; hard, firm, sticky and plastic; few fine and common very fine roots; common very fine discontinuous tubular pores; few thin clay films on faces of peds and lining pores; 10 percent soft shale and siltstone fragments; secondary gypsum crystals segregated in very few fine irregularly shaped accumulations on faces of peds; strongly effervescent, secondary calcium carbonates segregated in few fine irregularly shaped accumulations on faces of peds; strongly alkaline; clear wavy boundary.

3Btkyn—14 to 24 inches; yellowish brown (10YR 5/4) with grayish brown (10YR 5/2) silty clay loam, dark yellowish brown (10YR 4/4) with dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to moderate coarse angular blocky; hard, firm, sticky and plastic; few fine and common very fine roots; common very fine discontinuous tubular pores; very few thin clay films on faces of peds and lining pores; 15 percent soft shale fragments; secondary gypsum crystals segregated in few fine irregularly shaped accumulations on faces of peds; strongly effervescent, secondary calcium carbonates segregated in few medium irregularly shaped accumulations on faces of peds; strongly alkaline; clear wavy boundary.

3BCy—24 to 30 inches; very pale brown (10YR 7/4) and light gray (10YR 7/2) gypsiferous material which is an apparent clay loam, yellowish brown (10YR 5/4) and grayish brown (10YR 5/2) moist; moderate very thick platy structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; few very fine horizontal tubular pores; 40 percent soft shale fragments; secondary gypsum crystals segregated in common fine irregularly shaped accumulations on faces of peds and on shale fragments; strongly effervescent; mildly alkaline; clear wavy boundary.

3Cy—30 to 37 inches; light yellowish brown (10YR 6/4) and light brownish gray (10YR 6/2) gypsiferous material which is an apparent clay loam, yellowish brown (10YR 5/4) and grayish brown (10YR 5/2) moist; massive, platy rock structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine horizontal tubular pores; 60 percent soft shale fragments; secondary gypsum crystals segregated in few fine irregularly shaped accumulations on shale fragments; strongly

effervescent; mildly alkaline; clear wavy boundary.

3Cr—37 inches; thinly interbedded shale and dolomitic limestone bedrock.

Range in Characteristics

Soil depth: 20 to 40 inches

Silicate clay content, control section weighted average: 35 to 45 percent

Rock fragment content, control section weighted average: 0 to 10 percent, mostly dolomitic limestone channers

Depth to base of natric horizon and top of gypsic horizon: 10 to 25 inches

Reaction: ranges from mildly alkaline in the substratum to strongly alkaline in the subsoil

E or A horizon:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry

Chroma: 3 or 4

Texture: very channery loam or channery silty clay loam

Rock fragments: total range is 15 to 55 percent; 5 to 10 percent pebbles,

10 to 40 percent channers (less than 3 inches long),

0 to 5 percent flagstones (less than 10 inches long)

Salinity, mmhos/cm: 0 to 2

Sodicity, SAR: 0 to 5

Calcium carbonate equivalent, <2 mm: 5 to 20 percent

Btn horizon:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

Texture: clay or silty clay

Clay content: 40 to 50 percent

Rock fragments: total range is 0 to 10 percent; 0 to 5 percent channers,

0 to 5 percent pebbles

Salinity, mmhos/cm: 2 to 4

Sodicity, SAR: 13 to 30

Calcium carbonate equivalent, <2 mm: 5 to 20 percent

Btkn and Btkyn horizons:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 through 4

Texture: silty clay loam, clay loam, or clay

Rock fragments: 0 to 5 percent channers

Salinity, mmhos/cm: 8 to 16

Sodicity, SAR: 13 to 30

Calcium carbonate equivalent, <2 mm: 5 to 15 percent

Gypsum content: 0 to 2 percent

Other features: 0 to 20 percent soft shale and siltstone fragments

BCy and Cy horizons:

Hue: 10YR or 2.5Y

Value: 5 through 7 dry, 4 through 6 moist

Chroma: 2 through 6

Texture: gypsiferous material which is an apparent clay loam or silty clay loam

Clay content: 27 to 40 percent

Salinity, mmhos/cm: 8 to 16

Sodicity, SAR: 13 to 30

Calcium carbonate equivalent, <2 mm: 5 to 10 percent

Gypsum content: 5 to 15 percent

Other features: 5 to 60 percent soft shale and siltstone fragments

Pennell Series

Classification: Loamy, mixed, mesic Lithic Calciorthids

Depth class: Shallow

Drainage class: Well drained

Permeability: Moderately rapid

Landform: Summits of mesas and structural benches

Parent material: Eolian material and residuum derived from sandstone and limestone

Slope range: 1 to 6 percent

Elevation: 5,000 to 5,500 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 54 to 56 degrees F.

Frost-free period: 150 to 170 days

Typical Pedon

Pennell loamy fine sand, in an area of map unit 522—Pennell loamy fine sand, 1 to 6 percent slopes; Apache County, Arizona; about 6.5 miles southeast of Tes Nez lah; 4,800 feet east and 1,250 feet south of the northwest corner of sec. 14, T.40N., R.25E.; latitude 36 degrees 52 minutes 43 seconds N and longitude 109 degrees 37 minutes 31 seconds W.

A—0 to 2 inches; yellowish red (5YR 5/6) loamy fine sand, yellowish red (5YR 4/6) moist; weak medium platy structure parting to weak fine granular; soft, very friable, nonsticky and nonplastic; few fine and common very fine roots; few very fine irregularly shaped pores; 10 percent pebbles; very slightly effervescent; mildly alkaline; clear smooth boundary.

Bw—2 to 5 inches; yellowish red (5YR 5/6) loamy fine sand, yellowish red (5YR 4/6) moist; weak medium subangular blocky structure; soft, very

friable, nonsticky and nonplastic; common fine and very fine roots; common very fine tubular pores; 5 percent pebbles; slightly effervescent; moderately alkaline; clear wavy boundary.

2Bk1—5 to 10 inches; reddish yellow (5YR 6/6) fine sandy loam, yellowish red (5YR 5/6) moist; moderate medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few medium, and common fine and very fine roots; few fine and common very fine tubular pores; 5 percent pebbles; strongly effervescent, secondary calcium carbonates segregated as common fine irregularly shaped accumulations on rock fragments and few fine irregularly shaped accumulations on faces of peds; moderately alkaline; clear wavy boundary.

2Bk2—10 to 14 inches; pink (5YR 7/4) gravelly sandy loam, reddish brown (5YR 5/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few fine and medium and common very fine roots; common very fine tubular pores; 20 percent pebbles and 5 percent cobbles; violently effervescent, secondary calcium carbonates segregated as many medium irregularly shaped accumulations on rock fragments and on faces of peds; moderately alkaline; clear wavy boundary.

2Bk3—14 to 18 inches; pinkish white (5YR 8/2) gravelly loam, pink (5YR 7/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine tubular pores; 15 percent pebbles and 5 percent cobbles; violently effervescent, matrix is impregnated with secondary calcium carbonates; moderately alkaline; abrupt wavy boundary.

2R—18 inches; limestone bedrock.

Range in Characteristics

Soil depth: 10 to 20 inches

Silicate clay content, control section weighted average: 10 to 18 percent

Depth to calcic horizon: 3 to 5 inches

Reaction: ranges from mildly alkaline in the surface to moderately alkaline in the underlying horizons

Bk horizons:

Value: 5 through 8 dry, 4 through 7 moist

Chroma: 2 through 6

Texture: fine sandy loam, gravelly sandy loam, or gravelly loam

Rock fragments: total range is 5 to 30 percent; 5 to 20 percent pebbles,

0 to 10 percent cobbles

Calcium carbonate equivalent: 5 to 10 percent in upper Bk and 15 to 40 percent in lower Bk

Persayo Series

Classification: Loamy, mixed (calcareous), mesic, shallow Typic Torriorthents

Depth class: Shallow

Drainage class: Well drained

Permeability: Moderate or moderately slow

Landform: Toeslopes, footslopes, and knolls on undulating plateaus, structural benches, and dipslopes of cuestas

Parent material: Alluvium and residuum derived from siltstone and shale

Slope range: 1 to 15 percent

Elevation: 4,900 to 6,300 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Persayo very fine sandy loam, in an area of map unit 215—Persayo-Fordbutte association, 1 to 10 percent slopes; San Juan County, New Mexico; about 3 miles southwest of Little Water Trading Post; 2,400 feet north and 2,200 feet east of the southwest corner of sec. 4, T.25N., R.18W.; latitude 36 degrees 25 minutes 46 seconds N and longitude 108 degrees 45 minutes 55 seconds W.

A—0 to 2 inches; light yellowish brown (2.5Y 6/4) very fine sandy loam, olive brown (2.5Y 4/4) moist; moderate very thick platy structure parting to weak very fine granular; soft, very friable, slightly sticky and slightly plastic; few very fine roots; few fine vesicular pores; 5 percent channers; strongly effervescent; moderately alkaline; clear smooth boundary.

2BCy—2 to 6 inches; light brownish gray (2.5Y 6/2) loam, light olive brown (2.5Y 5/4) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common fine and very fine roots; few fine irregularly shaped pores; 15 percent soft shale fragments; 5 percent channers; secondary gypsum segregated as common fine irregularly shaped accumulations on faces of peds and in soft masses, few coarse sand-sized primary gypsum crystals; slightly effervescent; mildly alkaline; clear wavy boundary.

2Cy—6 to 18 inches; light yellowish brown (2.5Y 6/4) loam, light olive brown (2.5Y 5/4) moist; massive,

platy rock structure; hard, firm, slightly sticky and slightly plastic; common fine and very fine roots; 60 percent soft shale fragments; secondary gypsum segregated as few fine irregularly shaped accumulations on shale fragments, common coarse sand-sized primary gypsum crystals; very slightly effervescent; mildly alkaline; clear smooth boundary.

2Cr—18 inches; interbedded siltstone and shale bedrock.

Range in Characteristics

Soil depth: 10 to 20 inches

Silicate clay content, control section weighted average: 18 to 35 percent

Reaction: ranges from mildly alkaline to moderately alkaline in the horizons underlying the surface

A horizon:

Hue: 10YR or 2.5Y

Value: 6 or 7 dry, 4 or 5 moist

Chroma: 2 through 4

Texture: very fine sandy loam, silt loam, or loam

2BCy and 2Cy horizons:

Hue: 10YR or 2.5Y

Value: 6 or 7 dry, 4 or 5 moist

Chroma: 2 through 4

Texture: loam, silt loam, silty clay loam, or clay loam

Salinity, mmhos/cm: 4 to 16

Sodicity, SAR: 5 to 13

Calcium carbonate equivalent: 3 to 15 percent

Gypsum content: 2 to 10 percent

Other features: 15 to 60 percent soft siltstone or shale fragments

Piute Series

Classification: Sandy, mixed, mesic Lithic Torriorthents

Depth class: Very shallow

Drainage class: Well drained

Permeability: Rapid

Landform: Summits of structural benches and plateaus

Parent material: Eolian material and residuum derived from sandstone

Slope range: 1 to 25 percent

Elevation: 4,800 to 6,000 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 52 to 56 degrees F.

Frost-free period: 140 to 170 days

Typical Pedon

Piute gravelly loamy fine sand, in an area of map unit 515—Piute-Bluechief-Rock outcrop complex, 2 to 25 percent slopes; Apache County, Arizona; about 2.5 miles east-southeast of Mexican Water Trading Post; 2,200 feet west and 1,200 feet south of the northeast corner of sec. 4, T.40N., R.26E.; latitude 36 degrees 54 minutes 20 seconds N and longitude 109 degrees 33 minutes 36 seconds W.

A—0 to 3 inches; yellowish red (5YR 5/6) gravelly loamy fine sand, yellowish red (5YR 4/6) moist; weak thick platy structure parting to weak medium granular; soft, very friable, nonsticky and nonplastic; few fine and common very fine roots; few very fine irregularly shaped pores; 20 percent pebbles; slightly effervescent; moderately alkaline; abrupt smooth boundary.

2C—3 to 7 inches; light reddish brown (5YR 6/4) fine sand, yellowish red (5YR 4/6) moist; massive, platy rock structure; hard, friable, nonsticky and nonplastic; few medium and common fine and very fine roots; few fine irregularly shaped pores; 70 percent soft sandstone fragments; slightly effervescent; moderately alkaline; abrupt smooth boundary.

2R—7 inches; sandstone bedrock.

Range in Characteristics

Soil depth: 4 to 10 inches

Silicate clay content, control section weighted average: 2 to 8 percent

A horizon:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 or 6

Rock fragments: total range is 15 to 20 percent; 10 to 20 percent pebbles, 0 to 5 percent channers

C or Ck horizons:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 or 6

Texture: fine sand or loamy fine sand

Other features: 5 to 70 percent soft sandstone fragments

Quezcan Series

Classification: Fine, montmorillonitic (calcareous), mesic Vertic Ustorthents

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Slow

Landform: Backslopes of escarpments

Parent material: Colluvium and residuum derived from shale, claystone, and sandstone

Slope range: 35 to 65 percent

Elevation: 6,500 to 8,000 feet

Mean annual precipitation: 12 to 16 inches

Mean annual air temperature: 48 to 50 degrees F.

Frost-free period: 120 to 140 days

Typical Pedon

Quezcan very cobbly clay loam, extremely bouldery, in an area of map unit 413—Hozho-Quezcan-Rock outcrop complex, 35 to 70 percent slopes; San Juan County, New Mexico; about 6 miles west of Sanostee; 2,000 feet south and 2,000 feet west of the northwest corner of sec. 9, T.25N., R.20W; latitude 36 degrees 25 minutes 3 seconds N and longitude 108 degrees 58 minutes 51 seconds W.

A—0 to 3 inches; light gray (10YR 7/2) very cobbly clay loam, light brownish gray (10YR 6/2) moist; weak medium platy structure parting to moderate fine granular; soft, very friable, sticky and plastic; few coarse to very fine roots; few very fine irregularly shaped pores; 25 percent pebbles, 20 percent cobbles, 5 percent boulders, and 3 percent stones; slightly effervescent; moderately alkaline; clear smooth boundary.

Bk—3 to 6 inches; light gray (10YR 7/2) gravelly clay loam, light brownish gray (10YR 6/2) moist; weak coarse subangular blocky structure; slightly hard, friable, sticky and plastic; few medium, common fine and common very fine roots; few fine and few very fine tubular pores; 15 percent pebbles and 5 percent cobbles; strongly effervescent, secondary calcium carbonates segregated as few fine and medium irregularly shaped accumulations on rock fragments; moderately alkaline; clear wavy boundary.

Bck—6 to 10 inches; light gray (5Y 7/1 with 10YR 7/2) clay loam, gray (5Y 6/1) with light brownish gray (10YR 6/2) moist; weak medium prismatic structure parting to moderate coarse subangular blocky; slightly hard, friable, sticky and plastic; few coarse, common medium, few fine, and few very fine roots; few fine and few very fine tubular pores; few thin cracks 3 to 6 mm wide; 5 percent pebbles; strongly effervescent, secondary calcium carbonates segregated as few fine and few medium irregularly shaped accumulations on ped faces and rock fragments; moderately alkaline; abrupt wavy boundary.

2Ck—10 to 19 inches; pink (5YR 8/3) and light gray (5Y 7/1) silty clay loam, light reddish brown (5YR 6/4) and gray (5Y 6/1) moist; moderate coarse prismatic structure parting to weak medium subangular blocky; hard, firm, very sticky and very plastic; few medium, common fine, and common very fine roots; few fine and very fine tubular pores; 40 percent soft shale fragments; few thin cracks 3 to 6 mm wide; slightly to strongly effervescent, secondary calcium carbonates segregated as few fine irregularly shaped accumulations on rock fragments; strongly alkaline; clear wavy boundary.

2C—19 to 27 inches; pink (5YR 8/3) silty clay loam, light reddish brown (5YR 6/4) moist; massive, platy rock structure; hard, firm, very sticky and very plastic; few medium, few fine, and common very fine roots; few very fine irregular pores; 70 percent soft shale fragments; slightly effervescent; strongly alkaline; gradual irregular boundary.

2Cr—27 inches; fractured shale bedrock.

Range in Characteristics

Soil depth: 20 to 40 inches

Silicate clay content, control section weighted average: 35 to 50 percent

Reaction: ranges from moderately alkaline in the surface to strongly alkaline in the underlying horizons

A horizon:

Value: 5 through 7 dry, 4 through 6 moist

Chroma: 2 through 4

Rock fragments: total range is 35 to 60 percent; 15 to 25 percent pebbles, 15 to 25 percent cobbles, 1 to 5 percent stones, 1 to 5 percent boulders

Bk and Bck horizon:

Hue: 10YR through 5Y

Value: 6 through 8 dry, 5 through 7 moist

Chroma: 2 through 4

Texture: gravelly clay loam, silty clay loam, or silty clay

Rock fragments: total range is 5 to 25 percent; 5 to 15 percent pebbles, 0 to 5 percent cobbles, 0 to 5 percent stones

Calcium carbonate equivalent: 5 to 10 percent

Other features: 0 to 30 percent soft shale or claystone fragments; some pedons have textures of cobbly clay loam or cobbly silty clay loam

2C horizons:*Hue:* 5YR through 5Y*Value:* 6 through 8 dry, 5 through 7 moist*Chroma:* 1 through 4*Texture:* silty clay loam or silty clay*Salinity, mmhos/cm:* 0 to 4*Calcium carbonate equivalent:* 3 to 10 percent*Gypsum content:* 0 to 2 percent*Other features:* 40 to 70 percent soft shale or claystone fragments; some pedons have hue of 2.5YR or 5GY**Ravola Series***Classification:* Fine-silty, mixed (calcareous), mesic
Typic Torrifluvents*Depth class:* Very deep*Drainage class:* Well drained*Permeability:* Moderate*Landform:* Alluvial fans and flood plains*Parent material:* Alluvium derived from siltstone*Slope range:* 1 to 3 percent*Elevation:* 4,900 to 6,000 feet*Mean annual precipitation:* 5 to 8 inches*Mean annual air temperature:* 51 to 54 degrees F.*Frost-free period:* 140 to 160 days**Typical Pedon**

Ravola very fine sandy loam, in an area of map unit 230—Ravola very fine sandy loam, 1 to 3 percent slopes; San Juan County, New Mexico; about 13 miles southwest of Shiprock; 1,900 feet west and 850 feet south of the northeast corner of sec. 6, T.27N., R.18W.; latitude 36 degrees 36 minutes 33 seconds N and longitude 108 degrees 47 minutes 50 seconds W.

A—0 to 3 inches; pale brown (10YR 6/3) very fine sandy loam, brown (10YR 5/3) moist; moderate very thick platy structure parting to moderate very fine granular; soft, very friable, slightly sticky and nonplastic; few very fine roots; few very fine vesicular pores; strongly effervescent; moderately alkaline; clear smooth boundary.

AC—3 to 10 inches; light yellowish brown (10YR 6/4) very fine sandy loam, yellowish brown (10YR 5/4) moist; moderate very thick platy structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and common very fine roots; few very fine tubular pores; strongly effervescent; moderately alkaline; clear smooth boundary.

C1—10 to 17 inches; light yellowish brown (10YR 6/4) loam, yellowish brown (10YR 5/4) moist; weak very thick platy structure parting to weak

coarse subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few fine and common very fine roots; few very fine tubular pores; few lamina of silt loam; strongly effervescent; moderately alkaline; clear smooth boundary.

C2—17 to 29 inches; light yellowish brown (10YR 6/4) very fine sandy loam, yellowish brown (10YR 5/4) moist; weak coarse prismatic structure parting to moderate coarse subangular blocky; hard, firm, slightly sticky and slightly plastic; few fine and common very fine roots; common very fine tubular pores; few lamina of silt loam; strongly effervescent, secondary calcium carbonates segregated as very few fine irregularly shaped accumulations as filaments; moderately alkaline; gradual smooth boundary.

C3—29 to 46 inches; light yellowish brown (10YR 6/4) loam, yellowish brown (10YR 5/4) moist; weak medium prismatic structure parting to moderate coarse subangular blocky; hard, firm, slightly sticky and slightly plastic; few fine and common very fine roots; common very fine tubular pores; few lenses of very fine sandy loam; strongly effervescent, secondary calcium carbonates segregated as few fine irregularly shaped accumulations as filaments; moderately alkaline; gradual smooth boundary.

C4—46 to 70 inches; pale brown (10YR 6/3) loam, yellowish brown (10YR 5/4) moist; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; common very fine tubular pores; few lenses of very fine sandy loam; secondary fine sand-sized gypsum crystals segregated in very few fine irregularly shaped filaments; strongly effervescent; moderately alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 18 to 27 percent

A and AC horizons:*Value:* 5 or 6 dry, 4 or 5 moist*Chroma:* 3 or 4**C horizons:***Hue:* 10YR or 2.5Y*Value:* 6 or 7 dry, 4 or 5 moist*Chroma:* 3 or 4*Texture:* stratified loam to very fine sandy loam*Salinity, mmhos/cm:* 0 to 4*Sodicity, SAR:* 0 to 5*Calcium carbonate equivalent:* 10 to 15 percent

Gypsum content: 0 to 2 percent

Other features: most pedons have thin strata, laminae, or lenses of silt loam and very fine sandy loam

Razito Series

Classification: Mixed, mesic Typic Torripsamments

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Rapid

Landform: Stable dunes and fan terraces

Parent material: Eolian material and alluvium derived from sandstone

Slope range: 1 to 8 percent

Elevation: 4,700 to 5,900 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Razito loamy fine sand, in an area of map unit 145—Razito-Huerfano complex, 0 to 8 percent slopes; San Juan County, New Mexico; about 24 miles east-northeast of Sheep Springs; 1,800 feet west and 2,325 feet south of the northeast corner of sec. 13, T.23N., R.14W.; latitude 36 degrees 13 minutes 40 seconds N and longitude 108 degrees 16 minutes 37 seconds W.

A—0 to 8 inches; light yellowish brown (10YR 6/4) loamy fine sand, brown (10YR 5/3) moist; weak very fine granular structure; soft, very friable, slightly sticky and nonplastic; few medium and common fine and very fine roots; slightly effervescent; mildly alkaline; clear smooth boundary.

C1—8 to 22 inches; light yellowish brown (10YR 6/4) loamy fine sand, yellowish brown (10YR 5/4) moist; massive; soft, very friable, slightly sticky and nonplastic; few medium and fine and common very fine roots; slightly effervescent; mildly alkaline; gradual smooth boundary.

C2—22 to 62 inches; light yellowish brown (10YR 6/4) fine sand, dark yellowish brown (10YR 4/4) moist; single grain; loose, nonsticky and nonplastic; few medium and fine and common very fine roots; slightly effervescent; mildly alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 4 to 8 percent

Reaction: ranges from neutral in the surface to moderately alkaline in the underlying horizons

A or AC horizons:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

Texture: loamy fine sand, loamy sand, or sand

C horizons:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

Texture: loamy fine sand, loamy sand, or fine sand

Salinity, mmhos/cm: 0 to 2

Sodicity, SAR: 0 to 5

Calcium carbonate equivalent: 1 to 3 percent

Recapture Series

Classification: Fine-loamy, mixed, mesic Typic Natrargids

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately slow in the subsoil and rapid in the lower substratum

Landform: Fan terraces

Parent material: Alluvium derived from sandstone and shale

Slope range: 1 to 5 percent

Elevation: 4,700 to 5,200 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 52 to 56 degrees F.

Frost-free period: 140 to 170 days

Typical Pedon

Recapture loamy fine sand, in an area of map unit 505—Recapture-Shorthair-Aneth complex, 1 to 8 percent slopes; Apache County, Arizona; about 3.5 miles north-northwest of Teec Nos Pos Trading Post; 1,400 feet west and 500 feet north of the southeast corner of sec. 10, T.41N., R.30E.; latitude 36 degrees 58 minutes 6 seconds N and longitude 109 degrees 6 minutes 24 seconds W.

A—0 to 3 inches; light reddish brown (5YR 6/4) loamy fine sand, reddish brown (5YR 4/4) moist; weak thick platy structure parting to moderate fine granular; soft, very friable, slightly sticky and nonplastic, few fine and common very fine roots; few very fine vesicular pores; slightly effervescent; mildly alkaline; abrupt smooth boundary.

2Bt1—3 to 7 inches; reddish brown (5YR 5/4) sandy clay loam, yellowish red (5YR 4/6) moist; moderate medium prismatic structure parting to weak coarse subangular blocky; hard, firm,

slightly sticky and slightly plastic; common fine and very fine roots; few very fine tubular pores; common thin clay films on faces of peds and lining pores; 5 percent pebbles; strongly effervescent; strongly alkaline; clear smooth boundary.

2B_{tn}2—7 to 17 inches; reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) moist; weak medium prismatic structure parting to moderate coarse subangular blocky; hard, friable, slightly sticky and nonplastic; common fine and very fine roots; few very fine tubular pores; few thin clay films on faces of peds and lining pores; 5 percent pebbles; strongly effervescent; very strongly alkaline; clear wavy boundary.

2B_{tkyn}1—17 to 23 inches; light reddish brown (5YR 6/3) clay loam, reddish brown (5YR 5/4) moist; moderate medium prismatic structure parting to weak coarse subangular blocky; hard, firm, sticky and plastic; few fine and common very fine roots; common very fine tubular pores; few thin clay films on faces of peds and lining pores; secondary gypsum segregated in few medium irregularly shaped soft masses; strongly effervescent, secondary calcium carbonates segregated in few medium irregularly shaped accumulations on faces of peds; very strongly alkaline; clear smooth boundary.

2B_{tkyn}2—23 to 39 inches; reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4) moist; moderate medium prismatic parting to weak coarse subangular blocky; hard, firm, slightly sticky and slightly plastic; few fine and common very fine roots; common very fine tubular pores; few thin clay films on faces of peds and lining pores; secondary gypsum segregated in few fine and medium irregularly shaped accumulations in filaments and in seams; strongly effervescent, secondary calcium carbonates segregated in few medium irregularly shaped accumulations on faces of peds and in seams; very strongly alkaline; clear wavy boundary.

2B_{CKyn}—39 to 53 inches; yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) moist; weak coarse prismatic structure parting to moderate coarse subangular blocky; slightly hard, friable, slightly sticky and nonplastic; few very fine roots; few very fine tubular pores; very few thin clay films bridging sand grains; 5 percent pebbles; secondary gypsum segregated in few

fine irregularly shaped soft masses; strongly effervescent, secondary calcium carbonates segregated in few fine irregularly shaped accumulations on faces of peds and on rock fragments; very strongly alkaline; abrupt irregular boundary.

2B_{Cy}—53 to 65 inches; light reddish brown (5YR 6/3) loamy fine sand, reddish brown (5YR 4/4) moist; weak coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine roots; few very fine irregularly shaped pores; 5 percent pebbles; secondary gypsum segregated in few fine irregularly shaped accumulations in filaments; slightly effervescent; strongly alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 18 to 35 percent

Depth to base of natric horizon: 20 to 40 inches

Depth to calcic horizon: 15 to 30 inches

Reaction: ranges from mildly alkaline in the surface to very strongly alkaline in the subsoil and substratum

A horizon:

Hue: 5YR or 7.5YR

Value: 4 or 5 moist

Chroma: 3 or 4

B_{tn} horizon:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 through 6

Texture: fine sandy loam or sandy clay loam

Salinity, mmhos/cm: 0 to 2

Sodicity, SAR: 13 to 30

B_{tkyn} horizons:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 through 6

Texture: clay loam or sandy clay loam

Salinity, mmhos/cm: 4 to 16

Sodicity, SAR: 30 to 60

Calcium carbonate equivalent: 10 to 30 percent, with at least one subhorizon more than 6 inches thick having more than 15 percent

Gypsum content: 5 to 10 percent

BC horizons:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 through 6

Texture: fine sandy loam or loamy fine sand

Salinity, mmhos/cm: 4 to 8

Sodicity, SAR: 5 to 30

Calcium carbonate equivalent: 1 to 10 percent

Gypsum content: 1 to 10 percent

Redlands Series

Classification: Fine-loamy, mixed, mesic Typic Haplargids

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Fan terraces

Parent material: Eolian material and alluvium derived from sandstone and shale

Slope range: 1 to 3 percent

Elevation: 5,000 to 5,900 feet

Mean annual precipitation: 6 to 8 inches

Mean annual air temperature: 52 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Redlands loamy fine sand, in an area of map unit 511—Redlands loamy fine sand, 1 to 3 percent slopes; Apache County, Arizona; about 8 miles east-southeast of Red Mesa Trading Post; 625 feet south and 1,350 feet west of the northeast corner of sec. 22, T.41N., R.29E.; latitude 36 degrees 57 minutes 3 seconds N and longitude 109 degrees 12 minutes 53 seconds W.

A—0 to 2 inches; reddish brown (5YR 5/4) loamy fine sand, reddish brown (5YR 4/4) moist; moderate thick platy structure parting to moderate very fine granular; soft, very friable, nonsticky and nonplastic; common medium and fine and few very fine roots; common very fine irregularly shaped pores; slightly effervescent; mildly alkaline; abrupt smooth boundary.

AB—2 to 7 inches; yellowish red (5YR 5/6) fine sandy loam, reddish brown (5YR 4/4) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; common fine and few very fine roots; slightly effervescent; moderately alkaline; clear smooth boundary.

BA—7 to 13 inches; yellowish red (5YR 5/6) fine sandy loam, reddish brown (5YR 4/4) moist; moderate coarse subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; common fine and very fine roots; common very fine tubular pores; very few clay films bridging sand grains; slightly effervescent; moderately alkaline; abrupt smooth boundary.

Bt1—13 to 22 inches; reddish brown (5YR 5/3) fine sandy loam, reddish brown (5YR 4/3) moist; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and common very fine roots; common very fine tubular pores; few thin clay films on faces of peds and lining pores; strongly effervescent; moderately alkaline; clear smooth boundary.

Bt2—22 to 42 inches; reddish brown (5YR 5/3) clay loam, dark reddish brown (5YR 3/3) moist; moderate medium prismatic structure parting to moderate coarse subangular blocky; very hard, firm, sticky and plastic; common very fine roots; common very fine tubular pores; common thin clay films on faces of peds and lining pores; violently effervescent, secondary calcium carbonates segregated as very few fine irregularly shaped accumulations on faces of peds; strongly alkaline; gradual smooth boundary.

Bk—42 to 65 inches; reddish brown (5YR 5/3) sandy clay loam, reddish brown (5YR 4/3) moist; moderate coarse subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few very fine roots; common fine tubular pores; strongly effervescent, secondary calcium carbonates segregated in few fine irregularly shaped accumulations on faces of peds; strongly alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 18 to 27 percent

Reaction: ranges from mildly alkaline in the surface to strongly alkaline in the lower subsoil and substratum

AB and BA horizons:

Chroma: 4 or 6

Bt1 horizon:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 through 6

Texture: fine sandy loam or sandy clay loam

Sodicity, SAR: 0 to 5

Calcium carbonate equivalent: 3 to 5 percent

Bt2 and Bk horizons:

Value: 3 or 4 moist

Chroma: 3 or 4

Texture: clay loam or sandy clay loam

Salinity, mmhos/cm: 2 to 4

Sodicity, SAR: 5 to 13

Calcium carbonate equivalent: 5 to 10 percent

Retaw Series

Classification: Fine-loamy, mixed, frigid Histic Epiaquolls

Depth class: Very deep

Drainage class: Very poorly drained

Permeability: Very slow

Landform: Small rock basins of undulating high plateaus and mesas

Parent material: Lacustrine sediments and alluvium derived from sandstone

Slope range: 0 to 1 percent

Elevation: 8,500 to 9,200 feet

Mean annual precipitation: 20 to 22 inches

Mean annual air temperature: 40 to 42 degrees F.

Frost-free period: 80 to 100 days

Typical Pedon

Retaw muck, in an area of map unit 700—Akhoni-Retaw complex, 0 to 15 percent slopes, San Juan County, New Mexico; about 8 miles southwest of Toadlena; 2,250 feet west and 1,300 feet south of the northeast corner of sec. 23, T.22N., R.20W.; latitude 36 degrees 7 minutes 47 seconds N and longitude 108 degrees 56 minutes 31 seconds W.

Oa—0 to 3 inches; black (10YR 2/1) muck, very dark gray (10YR 3/1) dry, massive; slightly hard, friable, slightly sticky and nonplastic; common fine and very fine roots; few small fragments of wood; moderately acid; clear smooth boundary.

A1—3 to 8 inches; black (10YR 2/1) mucky silt loam, very dark gray (10YR 3/1) dry, weak very thick platy structure parting to moderate medium subangular blocky; hard, firm, slightly sticky and slightly plastic; few fine and common very fine roots; few very fine tubular pores; non-effervescent; moderately acid; gradual smooth boundary.

A2—8 to 13 inches; black (10YR 2/1) mucky silty clay loam, very dark gray (10YR 3/1) dry, few fine prominent brown (7.5YR 4/4) redox concentrations; weak very thick platy structure; very hard, very firm, sticky and plastic; few fine and very fine roots; few very fine tubular pores; few laminae of fine sandy loam; non-effervescent; moderately acid; clear smooth boundary.

Cg1—13 to 23 inches; dark gray (10YR 4/1) fine sandy loam, grayish brown (10YR 5/2) dry, few fine prominent brownish yellow (10YR 6/6) redox concentrations; massive; hard, firm, slightly sticky and slightly plastic; few fine and very fine

roots; few fine and very fine tubular pores; few laminae of sandy clay loam; 5 percent pebbles; non-effervescent; moderately acid; clear smooth boundary.

Cg2—23 to 33 inches; gray (10YR 5/1) silty clay, light brownish gray (10YR 6/2) dry, common fine and medium prominent strong brown (7.5YR 5/8) redox concentrations; massive; very hard, very firm, very sticky and very plastic; few very fine roots; few very fine tubular pores; few thin strata of sandy loam; large prominent black (10YR 2/1) organic stains along few angular seams; moderately acid; abrupt smooth boundary.

C1—33 to 45 inches; grayish brown (2.5Y 5/2) sandy loam, light brownish gray (10YR 6/2) dry, few medium prominent strong brown (7.5YR 4/6) and few fine prominent yellowish red (5YR 4/6) redox concentrations; massive; hard, friable, slightly sticky and nonplastic; few very fine tubular pores; few laminae of sandy clay loam; moderately acid; clear smooth boundary.

C2—45 to 70 inches; light olive brown (2.5Y 5/4) sandy loam, light gray (2.5Y 7/2) dry, few fine prominent dark yellowish brown (10YR 4/4) redox concentrations; massive; hard, friable, slightly sticky and nonplastic; few very fine tubular pores; few lenses of loamy sand; moderately acid.

Range in Characteristics

Silicate clay content, control section weighted average: 18 to 35 percent

Depth to base of histic epipedon: 2 to 4 inches

Depth to base of mollic epipedon: 10 to 16 inches

Reaction: ranges from moderately acid to slightly acid

Depth of ponded water: a few inches to 4 feet

Oa horizon:

Hue: 10YR or N (neutral)

Value: 3 or 4 dry, 2 or 3 moist

Chroma: 0 or 1

A1 horizon:

Hue: 10YR or N (neutral)

Value: 3 or 4 dry

Chroma: 0 or 1

A2 horizon:

Hue: 10YR or N (neutral)

Value: 3 or 4 dry, 2 or 3 moist

Chroma: 0 or 1

Texture: mucky silty clay loam, mucky clay loam, or mucky silty clay

Clay content: 35 to 45 percent

Redoximorphic features: none to few, fine to medium, prominent, brown or strong brown redox concentrations

Cg horizons:

Hue: 10YR through 5Y

Value: 5 through 7 dry, 4 through 6 moist

Chroma: 1 or 2

Texture: stratified fine sandy loam to silty clay

Clay content: 18 to 45 percent

Redoximorphic features: few to common, fine to medium, distinct or prominent, dark yellowish brown, strong brown, or yellowish red redox concentrations; a reduced matrix (strong gleying) is present

Lower C horizons:

Hue: 10YR through 5Y

Value: 6 or 7 dry, 5 or 6 moist

Chroma: 2 through 4

Texture: stratified loamy sand to sandy clay loam

Clay content: 10 to 25 percent

Redoximorphic features: few to common, fine to medium, prominent, dark yellowish brown, strong brown, or yellowish red redox concentrations; a reduced matrix may also be present

Rizno Series

Classification: Loamy, mixed (calcareous), mesic
Lithic Ustic Torriorthents

Depth class: Very shallow

Drainage class: Well drained

Permeability: Moderately rapid

Landform: Dipslopes of cuestas and summits of structural benches

Parent material: Eolian material and residuum derived from sandstone

Slope range: 2 to 20 percent

Elevation: 5,500 to 6,500 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F.

Frost-free period: 130 to 150 days

Typical Pedon

Rizno fine sandy loam, in an area of map unit 309—Rock outcrop-Rizno complex, 2 to 20 percent slopes; San Juan County, New Mexico; about 1.5 miles south of Beclabito; 2,350 feet north and 1,125 feet east of the southwest corner of sec. 13, T.30N., R.21W.; latitude 36 degrees 48 minutes 48 seconds N and longitude 109 degrees 1 minute 13 seconds W.

A—0 to 1 inch; yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) moist; weak

medium platy structure; soft, very friable, slightly sticky and nonplastic; common fine and very fine roots; common very fine irregularly shaped pores; slightly effervescent; mildly alkaline; clear smooth boundary.

AC—1 to 4 inches; yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few medium and common fine and very fine roots; few fine irregularly shaped pores; slightly effervescent; moderately alkaline; clear smooth boundary.

2C—4 to 6 inches; red (2.5YR 5/6) gravelly fine sandy loam, red (2.5YR 4/6) moist; massive, platy rock structure; slightly hard, friable, slightly sticky and nonplastic; common medium and fine and few very fine roots; 10 percent soft sandstone fragments; 25 percent pebbles; strongly effervescent; moderately alkaline; abrupt smooth boundary.

2R—6 inches; sandstone bedrock.

Range in Characteristics

Soil depth: 4 to 10 inches

Silicate clay content, control section weighted average: 8 to 18 percent

Reaction: ranges from mildly alkaline in the surface and subsurface to moderately alkaline in the underlying horizon

A and AC horizons:

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 4 or 6

2C horizon:

Hue: 2.5YR or 5YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 or 6

Rock fragments: 15 to 25 percent pebbles

Calcium carbonate equivalent: 1 to 5 percent

Other features: 0 to 30 percent soft sandstone fragments

Sandark Series

Classification: Sandy, mixed Entic Haploborolls

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Rapid

Landform: Fan terraces and toeslopes

Parent material: Alluvium derived from sandstone

Slope range: 1 to 15 percent

Elevation: 7,400 to 8,400 feet

Mean annual precipitation: 18 to 20 inches
Mean annual air temperature: 41 to 43 degrees F.
Frost-free period: 90 to 110 days

Typical Pedon

Sandark loamy fine sand, in an area of map unit 604—Yahmore-Sandark complex, 1 to 15 percent slopes, San Juan County, New Mexico; about 2.5 miles west-northwest of Toadlena; 100 feet west and 1,500 feet south of the northeast corner of sec. 11, T.23N., R.20W.; latitude 36 degrees 14 minutes 44 seconds N and longitude 108 degrees 56 minutes 6 seconds W.

Soil surface is covered by 2 inches of oak leaves, pine needles, and twigs; abrupt smooth boundary.

A—0 to 5 inches; dark grayish brown (10YR 4/2) loamy fine sand, very dark brown (10YR 2/2) moist; moderate medium subangular blocky structure parting to weak medium granular; soft, very friable, slightly sticky and nonplastic; common medium and very fine roots; few fine and very fine tubular pores; slightly acid; clear smooth boundary.

Bw1—5 to 16 inches; brown (7.5YR 4/3) loamy fine sand, dark brown (7.5YR 3/3) moist; moderate coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine and common medium roots; few very fine and fine tubular pores; neutral; clear wavy boundary.

Bw2—16 to 27 inches; brown (7.5YR 4/2) loamy fine sand, dark brown (7.5YR 3/2) moist; moderate coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine and common medium roots; few very fine and fine tubular pores; neutral; clear smooth boundary.

Bw3—27 to 36 inches; brown (7.5YR 4/3) fine sand, dark brown (7.5YR 3/3) moist; moderate medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine and medium roots; few very fine tubular pores; neutral; clear smooth boundary.

E and Bt—36 to 66 inches; brown (10YR 5/3) fine sand (E part), dark brown (10YR 4/3) moist, with brown (7.5YR 5/4) loamy fine sand lamellae (Bt part), brown (7.5YR 4/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few medium and very fine roots; few very fine tubular pores; clay coatings on sand grains in few thin discontinuous lamellae less than 0.5 inches thick; neutral.

Range in Characteristics

Silicate clay content, control section weighted average: 2 to 8 percent

Depth to base of mollic epipedon: 16 to 40 inches

Reaction: ranges from slightly acid in the surface to neutral in the underlying horizons

A horizon:

Value: 3 or 4 dry, 2 or 3 moist

Bw horizons:

Hue: 7.5YR or 10YR

Value: 4 or 5 dry, 3 or 4 moist

Texture: loamy fine sand, fine sand, or loamy sand

E and Bt horizon:

Hue: 7.5YR or 10YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 2 or 3

Texture: fine sand, loamy sand, or loamy fine sand

Other features: lamellae are less than 1 cm thick, or are less than 6 inches total within 80 inches

Sandbench Series

Classification: Sandy, mixed, mesic Typic Calciorthids

Depth class: Moderately deep

Drainage class: Somewhat excessively drained

Permeability: Rapid

Landform: Summits of structural benches

Parent material: Eolian material and residuum derived from sandstone

Slope range: 1 to 8 percent

Elevation: 4,800 to 6,000 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 52 to 56 degrees F.

Frost-free period: 140 to 170 days

Typical Pedon

Sandbench fine sand, in an area of map unit 521—Sandbench-Sheppard fine sands, 1 to 8 percent slopes; Apache County, Arizona; about 2.5 miles west of Hogansani Spring; 1,750 feet east and 200 feet north of the southwest corner of sec. 21, T.40N., R.26E.; latitude 36 degrees 51 minutes 8 seconds N and longitude 109 degrees 33 minutes 23 seconds W.

A—0 to 3 inches; yellowish red (5YR 5/8) fine sand, yellowish red (5YR 4/6) moist; weak very thick platy structure parting to weak medium granular; soft, very friable, nonsticky and nonplastic; few fine and common very fine roots; few very fine irregularly shaped pores; mildly alkaline; clear smooth boundary.

BA—3 to 11 inches; yellowish red (5YR 5/8) fine sand, yellowish red (5YR 4/6) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine and few very fine roots; few very fine irregularly shaped pores; mildly alkaline; clear wavy boundary.

Bk1—11 to 17 inches; yellowish red (5YR 5/6) loamy fine sand, yellowish red (5YR 4/6) moist; weak coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; few fine and very fine roots; few very fine tubular pores; strongly effervescent, secondary calcium carbonate segregated as few fine accumulations in soft rounded masses and coating sand grains; moderately alkaline; abrupt wavy boundary.

2Bk2—17 to 21 inches; pink (5YR 7/3) loamy fine sand, reddish yellow (5YR 6/6) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few medium to very fine roots; few fine and very fine tubular pores; 5 percent soft sandstone fragments; violently effervescent, secondary calcium carbonate segregated as many fine and medium irregularly shaped accumulations in soft masses and coating rock fragments; moderately alkaline; abrupt smooth boundary.

2Ck—21 to 31 inches; reddish yellow (5YR 7/6) loamy fine sand, yellowish red (5YR 5/6) moist; massive, platy rock structure; slightly hard, very friable, slightly sticky and nonplastic; few medium and fine and common very fine roots; few fine and very fine irregularly shaped pores; 70 percent soft sandstone fragments; strongly effervescent, secondary calcium carbonate segregated as common medium irregularly shaped accumulations on rock fragments and coating sand grains; moderately alkaline; abrupt smooth boundary.

2R—31 inches; sandstone bedrock.

Range in Characteristics

Soil depth: 20 to 40 inches

Silicate clay content, control section weighted average: 2 to 8 percent

Depth to calcic horizon: 8 to 15 inches

Reaction: ranges from mildly alkaline in the surface to moderately alkaline in the underlying horizons

A and BA horizons:

Chroma: 4 to 8

Bk and Ck horizons:

Value: 5 through 8 dry, 4 through 7 moist

Chroma: 2 through 6

Texture: loamy fine sand or fine sand

Calcium carbonate equivalent: 5 to 20 percent

Other features: 0 to 70 percent soft sandstone fragments

Sanostee Series

Classification: Fine-loamy, mixed, mesic Ustalfic Haplargids

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Moderate

Landform: Toeslopes of mesas, structural benches, and dipslopes of cuestas

Parent material: Eolian material, alluvium, and residuum derived from sandstone and siltstone

Slope range: 1 to 10 percent

Elevation: 5,900 to 6,800 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F.

Frost-free period: 130 to 150 days

Typical Pedon

Sanostee loamy fine sand, in an area of map unit 301—Farview-Sanostee-Rock outcrop association, 1 to 10 percent slopes; San Juan County, New Mexico; about 6 miles south-southeast of Sanostee; 1,950 feet north and 1,500 feet east of the southwest corner of sec. 2, T.24N., R.19W.; latitude 36 degrees 20 minutes 29 seconds N and longitude 108 degrees 50 minutes 24 seconds W.

A—0 to 2 inches; light brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 4/4) moist; weak thin platy structure parting to weak fine granular; soft, very friable, nonsticky and nonplastic; few medium and very fine roots; 5 percent small channers; mildly alkaline; clear smooth boundary.

2Bt—2 to 10 inches; brown (7.5YR 4/4) sandy clay loam, strong brown (7.5YR 4/6) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few medium and fine and common very fine roots; common very fine tubular pores; few thin

patchy clay films on faces of peds and lining pores, and common clay bridges between sand grains; slightly effervescent, secondary calcium carbonate segregated in very few fine irregularly shaped filaments in lower part of horizon; mildly alkaline; clear smooth boundary.

2Btk—10 to 15 inches; light brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 5/4) moist; moderate coarse subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few medium and fine and common very fine roots; few very fine tubular pores; few thin clay films lining pores and bridging sand grains; 5 percent channers; strongly effervescent, secondary calcium carbonate segregated as common, fine and medium, irregularly shaped accumulations on faces of peds, on rock fragments, and on sand grains; strongly alkaline; clear wavy boundary.

3Bk—15 to 24 inches; white (10YR 8/1) loam, very pale brown (10YR 7/3) moist; moderate coarse subangular blocky structure; slightly hard, friable, sticky and slightly plastic; few fine and common very fine roots; few very fine tubular pores; 5 percent soft siltstone fragments; violently effervescent, matrix is impregnated with secondary calcium carbonate; strongly alkaline; clear wavy boundary.

3BCKy—24 to 28 inches; light gray (10YR 7/2) with brownish yellow (10YR 6/6) loam, pale brown (10YR 6/3) with yellowish brown (10YR 5/6) moist; weak coarse subangular blocky structure; slightly hard, friable, sticky and slightly plastic; few fine and common very fine roots; common very fine tubular pores; 20 percent soft siltstone fragments; 5 percent small channers; secondary gypsum crystals segregated as very few fine irregularly shaped accumulations on faces of peds and in small masses; strongly effervescent, secondary calcium carbonate segregated in common, fine and medium, irregularly shaped accumulations on faces of peds and on rock fragments; moderately alkaline; clear wavy boundary.

3C—28 to 32 inches; very pale brown (10YR 7/4) sandy loam, yellowish brown (10YR 5/6) moist; massive, platy rock structure; soft, very friable, slightly sticky and nonplastic; few fine and very fine roots; few very fine irregularly shaped pores; 20 percent soft sandstone fragments; strongly effervescent, secondary calcium carbonate

segregated as very few fine irregularly shaped accumulations on sand grains and rock fragments; moderately alkaline; clear smooth boundary.

3R—32 inches; sandstone bedrock.

Range in Characteristics

Soil depth: 20 to 40 inches

Silicate clay content, control section weighted average: 18 to 30 percent

Rock fragment content, control section weighted average: 0 to 5 percent pebbles or small channers

Depth to base of the argillic horizon: 10 to 25 inches

Depth to calcic horizon: 14 to 26 inches

Reaction: ranges from mildly alkaline in the surface to strongly alkaline in the subsoil and substratum

A horizon:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 4 or 5 moist

Salinity, mmhos/cm: 0 to 2

Bt and Btk horizons:

Value: 4 through 6 dry, 4 or 5 moist

Chroma: 4 through 6

Texture: sandy clay loam, fine sandy loam, or sandy loam

Salinity, mmhos/cm: 2 to 4

Sodicity, SAR: 0 to 5

Calcium carbonate equivalent: 1 to 15 percent

Bk horizon:

Hue: 7.5YR or 10YR

Value: 6 through 8 dry, 5 through 7 moist

Chroma: 1 through 4

Texture: loam, sandy clay loam, or sandy loam

Salinity, mmhos/cm: 4 to 8

Sodicity, SAR: 5 to 13

Calcium carbonate equivalent: 15 to 40 percent

Other features: 0 to 15 percent soft siltstone and sandstone fragments

BC and C horizons:

Value: 6 or 7 dry, 5 or 6 moist

Chroma: 2 through 6

Texture: loam, sandy clay loam, or sandy loam

Salinity, mmhos/cm: 4 to 8

Sodicity, SAR: 5 to 13

Calcium carbonate equivalent: 5 to 10 percent

Gypsum content: 0 to 5 percent present

Other features: 5 to 20 percent soft siltstone and sandstone fragments

Shalet Series

Classification: Loamy, mixed (calcareous), mesic, shallow Typic Torriorthents

Depth class: Shallow

Drainage class: Well drained

Permeability: Moderately slow

Landform: Footslopes and backslopes of escarpments

Parent material: Residuum derived from shale and sandstone

Slope range: 8 to 45 percent

Elevation: 4,800 to 5,500 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 52 to 56 degrees F.

Frost-free period: 140 to 170 days

Typical Pedon

Shalet sandy clay loam, in an area of map unit 508—Shalet-Rock outcrop complex, 8 to 45 percent slopes; Apache County, Arizona; about 5 miles north of Teec Nos Pos; 950 feet south and 1,500 feet west of the northeast corner of sec. 10, T.41N., R.30E.; latitude 36 degrees 58 minutes 44 seconds N and longitude 109 degrees 6 minutes 25 seconds W.

A—0 to 3 inches; dark reddish gray (5YR 4/2) with greenish gray (5GY 6/1) sandy clay loam, dark reddish brown (5YR 3/2) with greenish gray (5GY 5/1) moist; weak thick platy structure parting to moderate medium granular; slightly hard, friable, slightly sticky and slightly plastic; few medium and fine roots; common fine irregularly shaped pores; very slightly effervescent; moderately alkaline; clear wavy boundary.

C1—3 to 6 inches; greenish gray (5GY 6/1) and dark reddish gray (5YR 4/2) sandy clay loam, greenish gray (5GY 5/2) and dark reddish brown (5YR 3/2) moist; massive; slightly hard, friable, sticky and plastic; common medium and few fine and very fine roots; few very fine tubular pores; 30 percent soft shale fragments; very slightly effervescent; moderately alkaline; clear wavy boundary.

C2—6 to 15 inches; greenish gray (5GY 6/1) with dark reddish gray (5YR 4/2) sandy clay loam, greenish gray (5GY 5/1) with dark reddish brown (5YR 3/2) moist; massive; hard, firm, sticky and plastic; few medium and common fine and few very fine roots; few very fine tubular pores; 60 percent soft shale and sandstone fragments; secondary gypsum segregated as very few fine irregularly shaped accumulations on shale fragments; slightly effervescent; strongly alkaline; clear smooth boundary.

Cr—15 inches; interbedded shale and soft sandstone bedrock.

Range in Characteristics

Soil depth: 10 to 20 inches

Silicate clay content, control section weighted average: 20 to 35 percent

Reaction: ranges from moderately alkaline in the surface to strongly alkaline in the underlying horizons

A horizon:

Hue: 5YR through 5GY

Value: 4 through 6 dry, 3 through 5 moist

Chroma: 1 through 3

C horizons:

Hue: 5YR through 5GY

Value: 4 through 6 dry, 3 through 5 moist

Chroma: 1 through 3

Texture: sandy clay loam or clay loam

Salinity, mmhos/cm: 4 to 16

Sodicity, SAR: 5 to 30

Gypsum content: 0 to 1 percent

Other features: 15 to 70 percent soft shale and sandstone fragments

Sheppard Series

Classification: Mixed, mesic Typic Torripsamments

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Rapid

Landform: Stable dunes on undulating plains, plateaus, and dissected fan terraces

Parent material: Eolian material derived from sandstone

Slope range: 2 to 30 percent

Elevation: 4,800 to 5,800 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 52 to 56 degrees F.

Frost-free period: 140 to 170 days

Typical Pedon

Sheppard loamy fine sand, in an area of map unit 507—Sheppard loamy fine sand, 2 to 8 percent slopes, hummocky; Apache County, Arizona; about 8.5 miles east-southeast of Red Mesa Trading Post; 1,675 feet east and 1,575 feet north of the southwest corner of sec. 26, T.41N., R.29E.; latitude 36 degrees 56 minutes 1 second N and longitude 109 degrees 12 minutes 16 seconds W.

AC—0 to 3 inches; reddish brown (5YR 5/4) loamy fine sand, reddish brown (5YR 4/4) moist; weak medium platy structure; soft, very friable,

nonsticky and nonplastic; common fine and very fine roots; few very fine irregularly shaped pores; very slightly effervescent; mildly alkaline; gradual smooth boundary.

C1—3 to 21 inches; yellowish red (5YR 5/6) loamy fine sand, reddish brown (5YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; few fine and common very fine roots; few very fine tubular pores; very slightly effervescent; mildly alkaline; clear smooth boundary.

C2—21 to 51 inches; yellowish red (5YR 5/6) loamy fine sand, reddish brown (5YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; few fine and common very fine roots; few very fine tubular pores; slightly effervescent; mildly alkaline; clear smooth boundary.

C3—51 to 70 inches; yellowish red (5YR 5/6) loamy fine sand, reddish brown (5YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; few fine and very fine tubular pores; very slightly effervescent; mildly alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 4 to 8 percent

Reaction: ranges from mildly alkaline in the surface to moderately alkaline in the underlying horizons

A or AC horizons:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 through 8

Texture: loamy fine sand or fine sand

C horizons:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 through 8

Texture: loamy fine sand or fine sand

Shiprock Series

Classification: Coarse loamy, mixed, mesic Typic Haplargids

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately rapid

Landform: Summits of plateaus, dipslopes of cuestas, and fan terraces

Parent material: Eolian material and alluvium derived from sandstone

Slope range: 1 to 5 percent

Elevation: 4,800 to 6,100 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Shiprock loamy fine sand, in an area of map unit 205—Shiprock-Farb complex, 1 to 5 percent slopes; San Juan County, New Mexico; about 6 miles northwest of Little Water; 1,450 feet south and 1,250 feet west of the northeast corner of sec. 7, T.26N., R.18W.; latitude 36 degrees 30 minutes 21 seconds N and longitude 108 degrees 41 minutes 43 seconds W.

A—0 to 3 inches; light brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 4/4) moist; weak thick platy structure parting to weak very fine granular; soft, very friable, slightly sticky and nonplastic; few very fine roots; few very fine irregularly shaped pores; slightly effervescent; moderately alkaline; clear smooth boundary.

2BA—3 to 13 inches; brown (7.5YR 6/4) fine sandy loam, strong brown (7.5YR 4/6) moist; moderate medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; common fine and many very fine roots; few very fine tubular pores; strongly effervescent; moderately alkaline; clear smooth boundary.

2Bt—13 to 27 inches; brown (7.5YR 5/4) fine sandy loam, strong brown (7.5YR 6/4) moist; moderate coarse subangular blocky structure; hard, firm, slightly sticky and nonplastic; common fine and very fine roots; common very fine tubular pores; few thin clay films lining pores and common thin clay films bridging sand grains; strongly effervescent; strongly alkaline; clear smooth boundary.

2Btk—27 to 36 inches; brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; strong coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and common very fine roots; common very fine tubular pores; few thin clay films lining pores and bridging sand grains; strongly effervescent, secondary calcium carbonate segregated as common fine irregularly shaped accumulations on faces of peds and in filaments; strongly alkaline; clear wavy boundary.

2Bk—36 to 47 inches; brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few fine and very fine roots; common very fine tubular pores; strongly effervescent, secondary calcium

carbonate segregated as common fine irregularly shaped accumulations on faces of peds and in filaments; strongly alkaline; clear wavy boundary.

2BC—47 to 66 inches; brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; weak coarse subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few fine and very fine roots; few very fine irregularly shaped pores; strongly effervescent, secondary calcium carbonate segregated as very few fine filaments; moderately alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 8 to 18 percent

Depth to base of argillic horizon: 35 to 45 inches

Reaction: ranges from moderately alkaline in the surface to strongly alkaline in the subsoil and substratum

A horizon:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

Texture: loamy fine sand or fine sandy loam

Bt and Btk horizons:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 through 6

Texture: fine sandy loam or very fine sandy loam

Salinity, mmhos/cm: 0 to 4

Sodicity, SAR: 0 to 5

Calcium carbonate equivalent: 3 to 5 percent

Bk, BC, and C horizons:

Hue: 5YR or 7.5YR

Value: 5 through 7 dry, 4 through 6 moist

Chroma: 4 through 6

Texture: fine sandy loam or very fine sandy loam

Salinity, mmhos/cm: 0 to 8

Sodicity, SAR: 0 to 13

Calcium carbonate equivalent: 3 to 5 percent

Shoegame Series

Classification: Sandy-skeletal, mixed, mesic
Ustochreptic Calciorthids

Depth class: Very deep

Drainage class: Excessively drained

Permeability: Moderately rapid in upper part, very rapid in lower part

Landform: Low stream terraces

Parent material: Alluvium derived from quartz diorite and sandstone

Slope range: 2 to 5 percent

Elevation: 5,000 to 6,400 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F.

Frost-free period: 130 to 150 days

Typical Pedon

Shoegame very cobbly sandy loam, extremely stony, in an area of map unit 315—Shoegame-Riverwash complex, 2 to 5 percent slopes; Apache County, Arizona; about 4 miles southeast of Teec Nos Pos; 600 feet north and 1,150 feet east of the southwest corner of sec. 18, T.40N., R.31E.; latitude 36 degrees 52 minutes 10 seconds N and longitude 109 degrees 3 minutes 50 seconds W.

A—0 to 4 inches; light brown (7.5YR 6/4) very cobbly sandy loam, brown (7.5YR 4/3) moist; moderate medium platy structure parting to weak medium granular; soft, very friable, slightly sticky and nonplastic; few fine and common very fine roots; few very fine irregularly shaped pores; 20 percent cobbles, 10 percent pebbles, 10 percent stones, and 5 percent boulders; strongly effervescent; mildly alkaline; clear smooth boundary.

2Bk1—4 to 13 inches; light brown (7.5YR 6/4) very gravelly loamy coarse sand, brown (7.5YR 4/3) moist; single grain; loose, nonsticky and nonplastic; few medium and fine and common very fine roots; 45 percent pebbles and 5 percent cobbles; strongly effervescent, secondary calcium carbonate segregated as common fine thin coatings on rock fragments; moderately alkaline; abrupt wavy boundary.

3Bk2—13 to 19 inches; brown (7.5YR 5/4) cobbly fine sandy loam, brown (7.5YR 4/4) moist; moderate coarse subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few medium and fine and common very fine roots; few very fine tubular pores; 10 percent cobbles, 5 percent pebbles, and 5 percent stones; strongly effervescent, secondary calcium carbonate segregated as few fine irregularly shaped accumulations on faces of peds and common medium thin coatings on rock fragments; moderately alkaline; clear wavy boundary.

4Bk3—19 to 44 inches; pinkish gray (7.5YR 6/2) extremely cobbly coarse sand, brown (7.5YR 4/2) moist; single grain; loose, nonsticky and nonplastic; few coarse and fine and common very fine roots; 35 percent cobbles, 20 percent pebbles, and 10 percent stones; strongly effervescent, secondary calcium carbonate

segregated as many medium and large thin coatings on rock fragments; moderately alkaline; clear irregular boundary.

4BCK—44 to 65 inches; light brown (7.5YR 6/4) extremely stony coarse sand, weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few coarse, fine, and very fine roots; 40 percent stones, 20 percent cobbles, and 5 percent pebbles; slightly effervescent, secondary calcium carbonate segregated as few fine and medium thin coatings on rock fragments; mildly alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 2 to 8 percent

Depth to calcic horizon: 3 to 10 inches

Reaction: ranges from mildly alkaline in the surface to moderately alkaline in the underlying horizons

A horizon:

Value: 5 or 6 dry

Chroma: 2 through 4

Rock fragments: total range is 35 to 60 percent; 10 to 15 percent pebbles, 20 to 30 percent cobbles, 3 to 10 percent stones, 2 to 5 percent boulders

Bk1 and Bk2 horizon:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 through 4

Texture: stratified gravelly fine sandy loam to extremely cobbly loamy coarse sand averaging very gravelly loamy coarse sand or very cobbly loamy coarse sand

Rock fragments: total range is 35 to 60 percent; 20 to 30 percent pebbles, 15 to 25 percent cobbles, 0 to 5 percent stones

Calcium carbonate equivalent: 5 to 10 percent

Bk3 and BCK horizon:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 through 4

Texture: stratified very cobbly sand to extremely stony coarse sand

Rock fragments: total range is 50 to 70 percent; 5 to 10 percent pebbles, 20 to 25 percent cobbles, 25 to 35 percent stones

Calcium carbonate equivalent: 3 to 8 percent

Shorthair Series

Classification: Loamy, mixed, mesic Lithic Natrargids

Depth class: Shallow

Drainage class: Well drained

Permeability: Moderate

Landform: Footslopes and structural benches

Parent material: Alluvium and residuum derived from sandstone

Slope range: 1 to 8 percent

Elevation: 4,700 to 5,200 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 52 to 56 degrees F.

Frost-free period: 140 to 170 days

Typical Pedon

Shorthair gravelly loamy fine sand, in an area of map unit 505—Recapture-Shorthair-Aneth complex, 1 to 8 percent slopes, Apache County, Arizona; about 4 miles north of Teec Nos Pos; 1,600 feet south and 350 feet west of the northeast corner of sec. 15, T.41N., R.30E.; latitude 36 degrees 57 minutes 46 seconds N and longitude 109 degrees 6 minutes 12 seconds W.

A—0 to 1 inch; light reddish brown (5YR 6/4) gravelly loamy fine sand, reddish brown (5YR 4/4) moist; moderate very thick platy structure parting to weak fine granular; soft, very friable, nonsticky and nonplastic; few very fine roots; very few fine vesicular pores; 15 percent pebbles; strongly effervescent; moderately alkaline; abrupt smooth boundary.

Bt_n/E—1 to 5 inches; reddish brown (5YR 5/4) with pinkish gray (5YR 6/2) fine sandy loam, reddish brown (5YR 4/4) with reddish gray (5YR 5/2) moist; moderate medium prismatic structure parting to weak very thick platy; hard, firm, slightly sticky and nonplastic; common fine and few very fine roots; common fine tubular pores; common thin clay films on faces of peds and lining pores; 10 percent pebbles; strongly effervescent; very strongly alkaline; clear smooth boundary.

2BCK—5 to 9 inches; light reddish brown (5YR 6/4) fine sandy loam, reddish brown (5YR 5/4) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and nonplastic; few fine and common very fine roots; very few fine tubular pores; 25 percent soft sandstone fragments; strongly effervescent, secondary calcium carbonate segregated in few fine irregularly

shaped accumulations on undersides of rock fragments; very strongly alkaline; clear wavy boundary.

2C—9 to 16 inches; pink (5YR 7/3) loamy fine sand, reddish brown (5YR 5/3) moist; massive, platy rock structure; hard, friable, nonsticky and nonplastic; few fine and very fine roots; few fine irregularly shaped pores; 30 percent soft sandstone fragments; slightly effervescent; very strongly alkaline; clear wavy boundary.

2R—16 inches; sandstone bedrock.

Range in Characteristics

Soil depth: 10 to 20 inches

Silicate clay content, control section weighted average: 10 to 18 percent

Reaction: ranges from moderately alkaline in the surface to very strongly alkaline in the subsoil and substratum

A horizon:

Value: 5 through 7 dry, 4 or 5 moist

Chroma: 3 or 4

Rock fragments: total range is 15 to 25 percent; 15 to 20 percent pebbles

0 to 5 percent cobbles

Salinity, mmhos/cm: 0 to 2

Sodicity, SAR: 5 to 13

Btn/E horizon:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 through 4

Texture: fine sandy loam or sandy clay loam

Salinity, mmhos/cm: 2 to 4

Sodicity, SAR: 13 to 30

BC horizon:

Hue: 5YR or 7.5YR

Value: 6 or 7 dry, 4 through 6 moist

Chroma: 2 through 4

Texture: fine sandy loam or loamy fine sand

Salinity, mmhos/cm: 4 to 8

Sodicity, SAR: 30 to 60

Calcium carbonate equivalent: 5 to 10 percent

Other features: 5 to 35 percent soft sandstone fragments

C horizon:

Hue: 5YR through 5Y

Value: 5 through 8 dry, 4 through 6 moist

Chroma: 1 through 4

Texture: fine sandy loam or loamy fine sand

Salinity, mmhos/cm: 4 to 8

Sodicity, SAR: 30 to 80

Other features: 30 to 50 percent soft sandstone fragments

Shumbegay Series

Classification: Sandy, mixed, mesic Typic Torriorthents

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Moderately rapid

Landform: Hummocks and stable dunes of low stream terraces and structural benches

Parent material: Eolian material and alluvium derived from sandstone and siltstone

Slope range: 0 to 25 percent

Elevation: 4,700 to 5,800 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 52 to 56 degrees F.

Frost-free period: 140 to 170 days

Typical Pedon

Shumbegay loamy fine sand, in an area of map unit 519—Shumbegay loamy fine sand, 0 to 8 percent slopes; Apache County, Arizona; about 0.75 mile south of Mexican Water Trading Post; 3,350 feet south and 2,150 feet east of the northwest corner of sec. 31, T.41N., R.26E.; latitude 36 degrees 54 minutes 51 seconds N and longitude 109 degrees 35 minutes 59 seconds W.

A—0 to 2 inches; light reddish brown (5YR 6/4) loamy fine sand, reddish brown (5YR 4/4) moist; moderate thick platy structure parting to weak medium granular; soft, very friable, nonsticky and nonplastic; few fine and very fine roots; few very fine vesicular pores; soil surface has a thin black cryptogam crust; strongly effervescent; moderately alkaline; clear smooth boundary.

Btn—2 to 6 inches; red (2.5YR 5/6) loamy fine sand, red (2.5YR 4/6) moist; weak medium prismatic structure parting to moderate coarse subangular blocky; hard, friable, slightly sticky and nonplastic; few fine and common very fine roots; common very fine tubular pores; very few thin clay films on faces of peds and common thin clay films bridging sand grains; strongly effervescent; strongly alkaline; clear smooth boundary.

BC—6 to 10 inches; reddish yellow (5YR 6/6) loamy fine sand, yellowish red (5YR 5/6) moist; weak coarse subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; few coarse

and fine and common very fine roots; few fine and very fine tubular pores; slightly effervescent; strongly alkaline; clear wavy boundary.

C1—10 to 37 inches; reddish yellow (5YR 6/6) fine sand, yellowish red (5YR 4/6) moist; massive; soft, very friable, nonsticky and nonplastic; few fine and common very fine roots; few very fine tubular pores; few 1-2 cm lenses of very fine sandy loam; slightly effervescent; strongly alkaline; gradual smooth boundary.

C2—37 to 80 inches; reddish yellow (5YR 6/6) loamy fine sand, yellowish red (5YR 4/6) moist; massive; soft, very friable, nonsticky and nonplastic; few fine and very fine roots; few very fine tubular pores; few 1-2 cm lamina of silt loam; slightly effervescent; strongly alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: less than 8 percent

Salinity, mmhos/cm: 0 to 2

Calcium carbonate equivalent: 1 to 3 percent

Reaction: ranges from moderately alkaline in the surface to strongly alkaline in the underlying horizons

A horizon:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 through 6

B_{tn} horizon:

Hue: 2.5YR or 5YR

Sodicity, SAR: 13 to 30

BC horizon:

Value: 4 or 5 moist

Chroma: 6 through 8

Texture: fine sand or loamy fine sand

Sodicity, SAR: 5 to 30

C horizon:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 through 6

Texture: loamy fine sand and fine sand, with lenses and thin strata of very fine sandy loam, fine sandy loam, or silt loam

Sodicity, SAR: 5 to 30

Skyhawk Series

Classification: Fine-silty, mixed, mesic Ustollic Haplargids

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Moderately slow

Landform: Risers of dissected fan terraces

Parent material: Alluvium derived from basalt and residuum derived from siltstone

Slope range: 35 to 50 percent

Elevation: 5,800 to 7,200 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F.

Frost-free period: 130 to 150 days

Typical Pedon

Skyhawk extremely gravelly sandy loam, extremely stony, in an area of map unit 319—Skyhawk-Lavellga association, 5 to 50 percent slopes; San Juan County, New Mexico; about 7 miles north-northwest of Sanostee; 1,500 feet west and 1,350 feet north of the southeast corner of sec. 2, T.26N., R.20W.; latitude 36 degrees 30 minutes 49 seconds N and longitude 108 degrees 56 minutes 19 seconds W.

A—0 to 2 inches; brown (7.5YR 5/3) extremely gravelly sandy loam, dark brown (7.5YR 4/3) moist; moderate thick platy structure parting to weak medium granular; soft, very friable, slightly sticky and slightly plastic; common fine and few very fine roots; few fine and common very fine irregularly shaped pores; 35 percent pebbles, 15 percent channers, 10 percent cobbles, 10 percent flagstones, and 5 percent stones; slightly effervescent; neutral; abrupt smooth boundary.

B_{tk}—2 to 6 inches; brown (7.5YR 5/4) gravelly clay loam, dark brown (7.5YR 4/4) moist; moderate coarse subangular blocky structure; slightly hard, friable, sticky and plastic; few fine and common very fine roots; common very fine tubular pores; common thin clay films on faces of peds and lining pores; 20 percent pebbles and 10 percent channers; strongly effervescent, secondary calcium carbonate segregated as very few fine irregularly shaped accumulations on faces of peds and few fine irregularly shaped accumulations on rock fragments; mildly alkaline; abrupt wavy boundary.

2B_k1—6 to 13 inches; very pale brown (10YR 7/3) silty clay loam, pale brown (10YR 6/3) moist; moderate coarse prismatic structure parting to weak coarse subangular blocky; slightly hard, firm, sticky and plastic; few medium to very fine roots; few fine and common very fine tubular pores; 10 percent soft siltstone fragments; very few thin clay films on faces of peds and lining pores; strongly effervescent, secondary calcium carbonate segregated as common medium irregularly shaped accumulations on faces of

pedes and on rock fragments; strongly alkaline; clear smooth boundary.

2Bk2—13 to 18 inches; light gray (2.5Y 7/2) silty clay loam, light olive brown (2.5Y 5/4) moist; moderate medium subangular blocky structure; slightly hard, firm, sticky and plastic; few fine and common very fine roots; few fine and very fine tubular pores; 10 percent soft siltstone fragments; strongly effervescent, secondary calcium carbonate segregated as few fine irregularly shaped accumulations on faces of pedes and on rock fragments; strongly alkaline; clear smooth boundary.

2Bk3—18 to 23 inches; light gray (2.5Y 7/2) silty clay loam, light olive brown (2.5Y 5/4) moist; weak medium subangular blocky structure; slightly hard, firm, sticky and plastic; common very fine roots; few very fine tubular pores; 30 percent soft siltstone fragments; strongly effervescent, secondary calcium carbonate segregated as few fine irregularly shaped accumulations on faces of pedes and on rock fragments; strongly alkaline; clear smooth boundary.

2Cy—23 to 35 inches; light brownish gray (2.5Y 6/2) silty clay loam, light olive brown (2.5Y 5/4) moist; massive, platy rock structure; hard, firm, sticky and plastic; common very fine roots; few very fine tubular pores; 80 percent soft siltstone fragments; secondary fine sand-sized gypsum crystals segregated in common fine irregularly shaped accumulations on rock fragments; strongly effervescent; strongly alkaline; gradual smooth boundary.

2Cr—35 inches; interbedded siltstone and shale bedrock

Range in Characteristics

Soil depth: 20 to 40 inches

Silicate clay content, control section weighted average: 27 to 35 percent

Depth to base of argillic horizon: 4 to 10 inches

Depth to calcic horizon: 4 to 10 inches

Reaction: ranges from neutral in the surface to strongly alkaline in the substratum

A horizon:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

Rock fragments: total range is 60 to 80 percent; 40 to 50 percent pebbles and channers (less than 3 inches long),

15 to 20 percent cobbles and flagstones (less than 10 inches long),
5 to 10 percent stones

Btk horizon:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 4 or 5 moist

Texture: gravelly clay loam or gravelly loam

Rock fragments: total range is 15 to 35 percent; 15 to 30 percent pebbles and channers (less than 3 inches long),

0 to 5 percent cobbles and flagstones (less than 10 inches long),

Calcium carbonate equivalent: 5 to 15 percent

2Bk horizons:

Hue: 10YR or 2.5Y

Value: 6 or 7 dry, 5 or 6 moist

Chroma: 2 through 4

Calcium carbonate equivalent: 15 to 25 percent

Texture: silty clay loam or clay loam

Salinity, mmhos/cm: 0 to 2

Other features: 10 to 30 percent soft siltstone fragments

2Cy horizon:

Hue: 10YR or 2.5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 through 4

Calcium carbonate equivalent: 10 to 15 percent

Salinity, mmhos/cm: 2 to 4

Gypsum content: 0.5 to 2 percent

Other features: 50 to 80 percent soft siltstone fragments

Snapill Series

Classification: Fine-silty, mixed, mesic Ustalfic Haplargids

Depth class: Deep

Drainage class: Well drained

Permeability: Moderate

Landform: Summits of mesas and plateaus

Parent material: Eolian material and alluvium derived from siltstone and sandstone

Slope range: 1 to 6 percent

Elevation: 5,600 to 6,100 feet

Mean annual precipitation: 8 to 10 inches

Mean annual air temperature: 50 to 52 degrees F.

Frost-free period: 130 to 150 days

Typical Pedon

Snapill very fine sandy loam, in an area of map unit 303—Snapill very fine sandy loam, 1 to 6 percent slopes; San Juan County, New Mexico; about 13.5

miles northeast of Shiprock; 900 feet north and 2,250 feet east of the southwest corner of sec. 30, T.32N., R.16W.; latitude 36 degrees 57 minutes 15 seconds N and longitude 108 degrees 3 minutes 58 seconds W.

A—0 to 3 inches; brown (7.5YR 5/4) very fine sandy loam, brown (7.5YR 4/4) moist; weak thin platy structure parting to weak fine granular; soft, very friable, slightly sticky and nonplastic; common very fine and few fine roots; very few vesicular pores; mildly alkaline; clear smooth boundary.

Bt1—3 to 8 inches; brown (7.5YR 5/4) loam, brown (7.5YR 4/4) moist; weak coarse subangular blocky structure; soft, friable, slightly sticky and slightly plastic; common very fine and fine roots; few fine tubular pores; few thin clay films on faces of peds and lining pores; slightly effervescent; mildly alkaline; clear smooth boundary.

Bt2—8 to 13 inches; brown (7.5YR 5/4) loam, brown (7.5YR 4/4) moist; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and few very fine roots; common very fine and few fine tubular pores; few thin clay films on faces of peds and lining pores; strongly effervescent; moderately alkaline; clear wavy boundary.

Btk1—13 to 22 inches; light brown (7.5YR 6/4) loam, brown, (7.5YR 5/4) moist; moderate medium and coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; few very fine tubular pores; few thin clay films on faces of peds and lining pores; strongly effervescent, secondary calcium carbonate segregated in few fine irregularly shaped soft masses and as accumulations on faces of peds; moderately alkaline; abrupt smooth boundary.

Btk2—22 to 38 inches; light brown (7.5YR 6/4) loam, brown (7.5YR 4/4) moist; strong medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; very few fine tubular pores; common thin clay films on faces of peds and lining pores; violently effervescent, secondary calcium carbonate segregated in many, medium and large, irregularly shaped soft masses and as fine accumulations on faces of peds; strongly alkaline; clear smooth boundary.

2BCK—38 to 53 inches; white (10YR 8/2) loam, pale brown (10YR 6/3) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; 25 percent soft siltstone and shale fragments; strongly effervescent, secondary calcium carbonate segregated in few fine irregularly shaped soft masses and filaments; strongly alkaline; clear smooth boundary.

3Cr—53 inches; interbedded shale and soft sandstone bedrock.

Range in Characteristics

Soil depth: 40 to 60 inches

Silicate clay content, control section weighted average: 18 to 27 percent

Depth to base of argillic horizon: 20 to 40 inches

Depth to calcic horizon: 9 to 22 inches

Reaction: ranges from mildly alkaline in the surface to strongly alkaline in the substratum

A horizon:

Salinity, mmhos/cm: 0 to 2

Bt horizon:

Hue: 5YR or 7.5YR

Value: 5 through 7 dry, 4 through 6 moist

Texture: loam or sandy clay loam

Very fine sand content: 35 to 60 percent

Salinity, mmhos/cm: 2 to 4

Sodicity, SAR: 5 to 13

Calcium carbonate equivalent: 5 to 15 percent

Btk horizon:

Hue: 5YR or 7.5YR

Value: 5 through 8 dry, 5 or 6 moist

Chroma: 2 through 4

Texture: loam, sandy clay loam, or very fine sandy loam

Very fine sand content: 35 to 60 percent

Salinity, mmhos/cm: 2 to 4

Sodicity, SAR: 5 to 30

Calcium carbonate equivalent: 10 to 40 percent (at least one subhorizon 6 inches or more thick has more than 15 percent)

2BCK horizon:

Hue: 7.5YR or 10YR

Value: 5 through 8 dry, 3 through 6 moist

Chroma: 2 through 4

Texture: loam, fine sandy loam, or sandy loam

Salinity, mmhos/cm: 4 to 8

Sodicity, SAR: 5 to 30

Calcium carbonate equivalent: 5 to 20 percent

Other features: 5 to 50 percent soft siltstone, sandstone, and shale fragments

Sogzie Series

Classification: Coarse-loamy, mixed, mesic Typic Haplargids

Depth class: Deep and very deep

Drainage class: Well drained

Permeability: Moderately rapid

Landform: Summits of plateaus and mesas, and dipslopes of cuestas

Parent material: Eolian material, alluvium, and residuum derived from sandstone and siltstone

Slope range: 1 to 6 percent

Elevation: 5,100 to 6,100 feet

Mean annual precipitation: 6 to 8 inches

Mean annual air temperature: 52 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Sogzie loamy fine sand, in an area of map unit 502—Sogzie loamy fine sand, 1 to 5 percent slopes; San Juan County, New Mexico; about 15 miles south of Beclabito; 1,775 feet north and 2,600 feet west of the southeast corner of sec. 25, T.28N., R.21W.; latitude 36 degrees 37 minutes 49 seconds N and longitude 109 degrees 1 minute 58 seconds W.

A—0 to 4 inches; yellowish red (5YR 5/6) loamy fine sand, reddish brown (5YR 4/4) moist; moderate medium platy structure parting to weak fine granular; soft, very friable, nonsticky and nonplastic; few medium and fine and common very fine roots; very slightly effervescent; mildly alkaline; clear smooth boundary.

BA—4 to 10 inches; yellowish red (5YR 5/6) loamy fine sand, yellowish red (5YR 4/6) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few coarse, medium, and fine, and common very fine roots; few fine tubular pores; slightly effervescent, secondary calcium carbonate segregated as very few fine irregularly shaped accumulations on faces of peds; mildly alkaline; clear wavy boundary.

Btk1—10 to 18 inches; light reddish brown (5YR 6/4) very fine sandy loam, yellowish red (5YR 4/6) moist; weak medium prismatic structure parting to moderate coarse subangular blocky; slightly hard, friable, slightly sticky and nonplastic; few fine and common very fine roots; few fine and

very fine tubular pores; few thin clay films on faces of peds and lining pores; strongly effervescent, secondary calcium carbonate segregated as few, fine and medium, irregularly shaped accumulations on faces of peds; moderately alkaline; clear smooth boundary.

Btk2—18 to 32 inches; pink (5YR 7/4) very fine sandy loam, yellowish red (5YR 5/6) moist; moderate medium prismatic structure parting to moderate coarse subangular blocky; hard, friable, slightly sticky and nonplastic; few fine and common very fine roots; common very fine tubular pores; few cylindrical cicada burrows; few thin clay films on faces of peds and lining pores; violently effervescent, secondary calcium carbonate segregated as common medium irregularly shaped accumulations on faces of peds; moderately alkaline; clear wavy boundary.

Btk3—32 to 50 inches; light reddish brown (5YR 6/4) very fine sandy loam, yellowish red (5YR 4/6) moist; weak medium prismatic structure parting to moderate coarse subangular blocky; hard, friable, slightly sticky and nonplastic; few fine and common very fine roots; common very fine tubular pores; few cylindrical cicada burrows; very few thin clay films on faces of peds and lining pores; violently effervescent, secondary calcium carbonate segregated as few fine irregularly shaped accumulations on faces of peds; moderately alkaline; clear smooth boundary.

Bck—50 to 70 inches; reddish yellow (5YR 6/6) fine sandy loam, yellowish red (5YR 4/6) moist; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few fine and very fine roots; few very fine tubular pores; strongly effervescent, secondary calcium carbonate segregated as few fine irregularly shaped accumulations on faces of peds; moderately alkaline.

Range in Characteristics

Soil depth: 40 to 60 inches or more

Silicate clay content, control section weighted average: 8 to 18 percent

Depth to base of argillic horizon: 36 to 50 inches

Depth to calcic horizon: 20 to 40 inches

Reaction: ranges from mildly alkaline in the surface to strongly alkaline in the subsoil and substratum

A and BA horizons:

Chroma: 4 or 6

Bt and Btk1 horizons:*Value:* 5 or 6 dry*Chroma:* 4 or 6*Texture:* very fine sandy loam or fine sandy loam*Calcium carbonate equivalent:* 5 to 10 percent**Lower Btk horizons:***Value:* 6 or 7 dry, 4 or 5 moist*Chroma:* 4 or 6*Texture:* very fine sandy loam or fine sandy loam*Calcium carbonate equivalent:* 5 to 25 percent**BCK horizon:***Hue:* 5YR or 10YR*Value:* 5 through 7 dry, 4 through 6 moist*Chroma:* 2 through 6*Texture:* fine sandy loam, loamy fine sand, or loamy sand*Salinity, mmhos/cm:* 0 to 4*Calcium carbonate equivalent:* 5 to 10 percent*Other features:* 5 to 20 percent soft sandstone fragments in deep phase**Sojourn Series***Classification:* Loamy, mixed (calcareous), mesic, shallow Aridic Ustorthents*Depth class:* Shallow*Drainage class:* Well drained*Permeability:* Moderate*Landform:* Footslopes of hills and backslopes of escarpments*Parent material:* Residuum derived from siltstone or mudstone*Slope range:* 15 to 50 percent*Elevation:* 6,200 to 7,400 feet*Mean annual precipitation:* 12 to 16 inches*Mean annual air temperature:* 48 to 50 degrees F.*Frost-free period:* 120 to 140 days**Typical Pedon**

Sojourn gravelly loam, in an area of map unit 411—Sojourn-Badland complex, 15 to 50 percent slopes; Apache County, Arizona; about 9 miles north of Cove; 50 feet north and 950 feet east of the southwest corner of sec. 15, T.38N., R.29E.; latitude 36 degrees 41 minutes 37 seconds N and longitude 109 degrees 13 minutes 32 seconds W.

A—0 to 2 inches; light reddish brown (2.5YR 6/4) gravelly loam, red (2.5YR 4/6) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; few fine and very fine

roots; 15 percent pebbles; strongly effervescent; moderately alkaline; abrupt smooth boundary.

Ck—2 to 5 inches; light reddish brown (2.5YR 6/4) silt loam, red (2.5YR 4/6) moist; massive, angular rock structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; 40 percent soft siltstone fragments; strongly effervescent, secondary calcium carbonate as few fine irregularly shaped accumulations segregated on rock fragments; moderately alkaline; clear wavy boundary.

C—5 to 15 inches; light reddish brown (2.5YR 6/4) silt loam, red (2.5YR 4/6) moist; massive, angular rock structure; slightly hard, friable, slightly sticky and slightly plastic; few medium and fine and common very fine roots; 70 percent soft siltstone fragments; strongly effervescent, secondary calcium carbonate as very few fine irregularly shaped accumulations segregated on rock fragments; moderately alkaline; clear wavy boundary.

Cr—15 inches; siltstone bedrock.

Range in Characteristics*Soil depth:* 10 to 20 inches*Silicate clay content, control section weighted average:* 12 to 18 percent*Reaction:* ranges from mildly alkaline in the surface to moderately alkaline in the underlying horizons**A horizon:***Hue:* 2.5YR or 5YR*Value:* 5 or 6 dry, 4 or 5 moist*Chroma:* 4 through 6*Rock fragments:* 15 to 20 percent pebbles**Ck horizon:***Hue:* 2.5YR or 5YR*Value:* 4 through 6 dry, 3 or 4 moist*Chroma:* 4 through 6*Texture:* silt loam or loam*Sand content:* less than 35 percent total sand; less than 15 percent fine sand and coarser*Calcium carbonate equivalent:* 10 to 15 percent*Other features:* 15 to 30 percent soft siltstone or mudstone fragments**C horizons:***Hue:* 2.5YR or 5YR*Value:* 5 or 6 dry, 4 or 5 moist*Chroma:* 4 through 6*Texture:* silt loam or loam

Sand content: less than 35 percent total sand; less than 15 percent fine sand and coarser
Calcium carbonate equivalent: 5 to 10 percent
Other features: 50 to 80 percent soft siltstone or mudstone fragments

Sonsela Series

Classification: Loamy-skeletal, mixed Mollic Eutroboralfs

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Backslopes of hills, buttes, and escarpments

Parent material: Colluvium derived from basalt and tuff-breccia

Slope range: 35 to 70 percent

Elevation: 8,200 to 9,800 feet

Mean annual precipitation: 20 to 24 inches

Mean annual air temperature: 39 to 41 degrees F.

Frost-free period: 60 to 90 days

Typical Pedon

Sonsela very cobbly fine sandy loam, extremely bouldery, in an area of map unit 712—Sonsela-Washpass-Viewpoint complex, 20 to 70 percent slopes; San Juan County, New Mexico; about 9 miles west-southwest of Sheep Springs; 450 feet north and 200 feet east of the southwest corner of sec. 27, T.22N., R.19W.; latitude 36 degrees 6 minutes 20 seconds N and longitude 108 degrees 51 minutes 43 seconds W.

Soil surface is covered by 1 inch of oak leaves, pine needles, and twigs; abrupt smooth boundary.

A—0 to 4 inches; dark brown (7.5YR 4/2) very cobbly fine sandy loam, very dark brown (7.5YR 2/2) moist; weak thick platy structure parting to moderate medium granular; soft, very friable, slightly sticky and nonplastic; few medium, few fine and common very fine roots; few very fine irregularly shaped pores; 30 percent pebbles, 15 percent cobbles, 5 percent stones, and 5 percent boulders; neutral; clear smooth boundary.

BA—4 to 9 inches; brown (7.5YR 5/3) gravelly fine sandy loam, dark brown (7.5YR 3/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few medium and common fine and very fine roots; common very fine irregularly

shaped pores; 20 percent pebbles and 5 percent cobbles; slightly acid; clear smooth boundary.

Bt1—9 to 16 inches; reddish brown (5YR 5/3) very gravelly fine sandy loam, reddish brown (5YR 4/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few coarse to fine and common very fine roots; few fine and very fine tubular pores; few moderately thick clay films on faces of peds and common thin clay films on faces of peds and bridging sand grains; 30 percent pebbles and 10 percent cobbles; slightly acid; gradual smooth boundary.

Bt2—16 to 26 inches; reddish brown (5YR 5/4) very gravelly sandy clay loam, reddish brown (5YR 4/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, firm, sticky and plastic; common coarse and few medium to very fine roots; few fine and common very fine tubular pores; few moderately thick clay films on faces of peds and common thin clay films on faces of peds and on rock fragments; 35 percent pebbles, 15 percent cobbles, and 5 percent stones; slightly acid; gradual smooth boundary.

Bt3—26 to 48 inches; reddish brown (5YR 5/4) very cobbly sandy clay loam, reddish brown (5YR 4/4) moist; moderate medium prismatic structure parting to weak medium subangular blocky; hard, firm, sticky and plastic; few coarse to very fine roots; few fine and common very fine tubular pores; few moderately thick clay films on faces of peds and common thin clay films on faces of peds and on rock fragments; 30 percent pebbles, 20 percent cobbles, and 5 percent stones; neutral; gradual wavy boundary.

Bt4—48 to 70 inches; brown (7.5YR 5/4) extremely cobbly fine sandy loam, brown (5YR 4/4) moist; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few coarse to very fine roots; few fine and common very fine tubular pores; few moderately thick clay films on faces of peds and few thin clay films on faces of peds and on rock fragments; 35 percent pebbles, 35 percent cobbles, and 5 percent stones; non-effervescent with some spots very slightly effervescent, secondary calcium carbonate segregated as very few fine rounded accumulations on faces of peds; neutral.

Range in Characteristics

Silicate clay content, control section weighted average: 18 to 27 percent

Rock fragment content, control section weighted average: 35 to 60 percent

Depth to base of argillic horizon: 60 inches or more

Reaction: ranges from slightly acid to neutral

A horizon:

Hue: 5YR or 7.5YR

Value: 3 or 4 dry, 2 or 3 moist

Rock fragments: total range is 35 to 60 percent; 15 to 25 percent pebbles, 15 to 20 percent cobbles, 5 to 15 percent stones or boulders

BA horizon:

Hue: 5YR or 7.5YR

Value: 4 or 5 dry, 3 or 4 moist

Texture: gravelly fine sandy loam or gravelly loam

Rock fragments: total range is 15 to 35 percent; 10 to 20 percent pebbles, 5 to 10 percent cobbles, 0 to 5 percent stones

Bt1 and Bt2 horizons:

Hue: 5YR or 7.5YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 or 4

Texture: very gravelly fine sandy loam, very gravelly sandy clay loam, or very gravelly sandy loam

Rock fragments: total range is 35 to 60 percent; 25 to 35 percent pebbles, 10 to 15 percent cobbles, 0 to 10 percent stones

Bt3 horizon:

Hue: 5YR or 7.5YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 or 4

Texture: very cobbly sandy clay loam, very cobbly fine sandy loam, or very cobbly sandy loam

Rock fragments: total range is 35 to 60 percent; 20 to 30 percent pebbles, 15 to 25 percent cobbles, 0 to 5 percent stones

Bt4 horizon:

Hue: 5YR or 7.5YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 or 4

Texture: extremely cobbly fine sandy loam or extremely cobbly sandy clay loam

Rock fragments: total range is 60 to 80 percent; 25 to 35 percent pebbles, 30 to 35 percent cobbles, 5 to 10 percent stones

Other features: some pedons contain very few calcium carbonate accumulations, and have up to 2 percent calcium carbonate equivalent

Strych Series

Classification: Loamy-skeletal, mixed, mesic Ustollic Calciorthids

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately rapid

Landform: Backslopes of stable landslides, and risers of fan terraces

Parent material: Colluvium and alluvium derived from sandstone and quartz diorite

Slope range: 15 to 70 percent

Elevation: 5,600 to 7,000 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F.

Frost-free period: 130 to 150 days

Typical Pedon

Strych extremely flaggy very fine sandy loam, rubbly, in an area of map unit 305—Strych-Eagleeye-Rock outcrop complex, 15 to 70 percent slopes; San Juan County, New Mexico; about 17 miles northeast of Shiprock; 1,900 feet north and 200 feet east of the southwest corner of sec. 16, T.32N., R.16W.; latitude 36 degrees 59 minutes 8 seconds N and longitude 108 degrees 32 minutes 46 seconds W.

A—0 to 3 inches; pale brown (10YR 6/3) extremely flaggy very fine sandy loam, brown (10YR 4/3) moist; weak medium platy structure parting to weak fine granular; soft, very friable, slightly sticky and nonplastic; few fine and very fine roots; few very fine irregularly shaped pores; 25 percent channers, 20 percent flagstones, 15 percent stones, and 10 percent boulders; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk1—3 to 15 inches; very pale brown (10YR 7/3) very flaggy very fine sandy loam, yellowish brown (10YR 5/4) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few coarse and medium, and common fine and very fine roots; few very fine tubular pores; 20 percent channers, 15 percent flagstones, and 5 percent stones; violently effervescent, secondary calcium carbonate segregated as common, fine and medium, irregularly shaped accumulations on faces of peds and on rock fragments; moderately alkaline; clear wavy boundary.

Bk2—15 to 28 inches; very pale brown (10YR 8/4) very stony very fine sandy loam, light yellowish brown (10YR 6/4) moist; moderate coarse subangular blocky structure; hard, firm, slightly sticky and nonplastic; few fine and very fine roots; few fine and very fine tubular pores; 20 percent channers, 15 percent stones, and 10 percent flagstones; violently effervescent, secondary calcium carbonate segregated as common, fine and medium, irregularly shaped accumulations on faces of peds and on rock fragments; moderately alkaline; clear wavy boundary.

Bk3—28 to 47 inches; light yellowish brown (10YR 6/4) very stony very fine sandy loam, yellowish brown (10YR 5/6) moist; moderate coarse subangular blocky structure; hard, firm, slightly sticky and nonplastic; few fine and common very fine roots; few fine and very fine tubular pores; 20 percent channers, 15 percent flagstones, and 15 percent stones; strongly effervescent, secondary calcium carbonate segregated as few fine irregularly shaped accumulations on faces of peds and on rock fragments; strongly alkaline; clear smooth boundary.

BC—47 to 64 inches; light yellowish brown (10YR 6/4) very stony very fine sandy loam, yellowish brown (10YR 5/6) moist; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few fine and very fine roots; few very fine tubular pores; 25 percent channers, 15 percent stones, and 10 percent flagstones; slightly effervescent; strongly alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 8 to 18 percent

Rock fragments, control section weighted average: 35 to 60 percent

Depth to calcic horizon: 2 to 5 inches

Reaction: ranges from mildly alkaline in the surface to strongly alkaline in the substratum

A horizon:

Hue: 5YR through 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

Texture: extremely flaggy very fine sandy loam, extremely cobbly fine sandy loam, or very cobbly fine sandy loam

Rock fragments: total range is 35 to 80 percent;

20 to 30 percent pebbles and channers (less than 3 inches long),
15 to 25 percent cobbles and flagstones (less than 10 inches long),
0 to 20 percent stones,
0 to 10 percent boulders

Bw horizon (where present):

Hue: 5YR through 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 through 6

Texture: gravelly fine sandy loam or cobbly fine sandy loam

Rock fragments: total range is 15 to 35 percent; 10 to 20 percent pebbles, 5 to 15 percent cobbles

Upper Bk horizons:

Hue: 5YR through 10YR

Value: 6 through 8 dry, 4 through 6 moist

Chroma: 4 through 6

Texture: very flaggy very fine sandy loam, very cobbly fine sandy loam, or very cobbly sandy loam

Rock fragments: total range is 35 to 60 percent; 15 to 25 percent pebbles and channers (less than 3 inches long), 15 to 30 percent cobbles and flagstones (less than 10 inches long), 0 to 10 percent stones
Calcium carbonate equivalent: 10 to 30 percent

Lower Bk horizons:

Hue: 5YR through 10YR

Value: 6 through 8 dry, 4 through 7 moist

Chroma: 0 through 6

Texture: very stony very fine sandy loam or very stony fine sandy loam

Rock fragments: total range is 40 to 60 percent; 15 to 20 percent pebbles and channers (less than 3 inches long), 10 to 15 percent cobbles and flagstones (less than 10 inches long), 15 to 25 percent stones
Salinity, mmhos/cm: 0 to 4
Sodicity, SAR: 0 to 13
Calcium carbonate equivalent: 10 to 15 percent

BC or Bk horizons:

Hue: 5YR through 10YR

Value: 5 through 7 dry, 4 or 5 moist

Chroma: 2 through 6

Texture: very stony very fine sandy loam, very stony fine sandy loam, very stony loamy fine sand, or gravelly fine sandy loam

Rock fragments: total range is 15 to 60 percent; 10 to 25 percent pebbles and channers (less than 3 inches long), 0 to 15 percent cobbles and flagstones (less than 10 inches long), 0 to 25 percent stones
Salinity, mmhos/cm: 0 to 4
Sodicity, SAR: 0 to 13
Calcium carbonate equivalent: 1 to 10 percent

Suwanee Series

Classification: Fine-loamy, mixed (calcareous), mesic Ustic Torrifluvents
Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Flood plains
Parent material: Alluvium derived from sandstone, siltstone, and shale
Slope range: 0 to 1 percent
Elevation: 5,300 to 5,800 feet
Mean annual precipitation: 5 to 8 inches
Mean annual air temperature: 51 to 54 degrees F.
Frost-free period: 140 to 160 days

Typical Pedon

Suwanee loam, in an area of map unit 175—Suwanee loam, 0 to 1 percent slopes; San Juan County, New Mexico; about 2 miles northeast of Newcomb; 2,300 feet west and 25 feet north of the southeast corner of sec. 17, T.24N., R.17W.; latitude 36 degrees 18 minutes 24 seconds N and longitude 108 degrees 40 minutes 26 seconds W.

A1—0 to 2 inches; brown (7.5YR 5/4) loam, brown (7.5YR 4/4) moist; moderate thick platy structure; soft, very friable, slightly sticky and slightly plastic; few very fine roots; few fine and very fine vesicular pores; strongly effervescent; moderately alkaline, abrupt smooth boundary.

A2—2 to 6 inches; brown (7.5YR 5/4) loam, brown (7.5YR 4/4) moist; weak thick platy structure; soft, friable, slightly sticky and plastic; few fine and very fine roots; few fine vesicular pores; strongly effervescent; moderately alkaline; clear smooth boundary.

C1—6 to 12 inches; brown (7.5YR 5/4) silty clay loam, brown (7.5YR 4/4) moist; massive; soft, friable, sticky and plastic; common fine and very fine roots; few fine tubular pores; strongly effervescent; moderately alkaline; clear wavy boundary.

C2—12 to 26 inches; light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4) moist; massive; soft, very friable, slightly sticky and slightly plastic; few fine and very fine roots; few fine tubular pores; one thin stratum of silt loam; strongly effervescent; moderately alkaline; abrupt smooth boundary.

C3—26 to 33 inches; light brown (7.5YR 6/4) silt loam, brown (7.5YR 5/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine and common very fine roots; few very fine tubular pores; strongly effervescent; strongly alkaline; clear smooth boundary.

C4—33 to 50 inches; light brown (7.5YR 6/4) very fine sandy loam, brown (7.5YR 5/4) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few fine and fine roots; few very fine irregularly shaped pores; few lamina of silty clay loam; strongly effervescent; moderately alkaline; gradual smooth boundary.

C5—50 to 64 inches; light brown (7.5YR 6/4) silt loam, brown (7.5YR 5/4) moist; massive; hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; few very fine irregularly shaped pores; few thin strata of loamy fine sand; strongly effervescent; moderately alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 18 to 35 percent

Other features: receives 2 to 5 additional inches of run-on moisture from summer flooding

C horizons:

Value: 5 or 6 dry, 4 or 5 moist

Texture: stratified fine sandy loam to silty clay loam

Salinity, mmhos/cm: 2 to 4

Sodicity, SAR: 0 to 5

Gypsum content: 0 to 1 percent

Tewa Series

Classification: Fine-loamy, mixed, mesic Typic Camborthids

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Fan terraces

Parent material: Alluvium derived from sandstone and shale

Slope range: 2 to 15 percent

Elevation: 5,500 to 6,100 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Tewa fine sandy loam, in an area of map unit 195—Tewa fine sandy loam, 2 to 15 percent slopes; San Juan County, New Mexico; about 3.5 miles south-southeast of Sanostee; 1,400 feet north and 750 feet east of the southwest corner of sec. 22, T.25N., R.19W.; latitude 36 degrees 23 minutes 51 seconds N and longitude 108 degrees 50 minutes 40 seconds W.

A—0 to 3 inches; yellowish brown (10YR 5/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak thick platy structure parting to moderate very fine granular; soft, very friable, slightly sticky and nonplastic; few fine and very fine roots; few very fine irregularly shaped pores; 5 percent pebbles and small channers; strongly effervescent; moderately alkaline; clear smooth boundary.

Bw—3 to 16 inches; light yellowish brown (10YR 6/4) fine sandy loam, yellowish brown (10YR 5/4) moist; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few medium, common fine, and common very fine roots; few fine and common very fine tubular pores; strongly effervescent, secondary calcium carbonate segregated in few fine filaments; moderately alkaline; clear smooth boundary.

Bk—16 to 27 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak medium prismatic structure parting to moderate coarse subangular blocky; hard, friable, slightly sticky and slightly plastic; few fine and common very fine roots; few fine and common very fine tubular pores; strongly effervescent, secondary calcium carbonate segregated in common fine irregularly shaped accumulations on faces of peds; moderately alkaline; clear smooth boundary.

By—27 to 45 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; few fine and very fine tubular pores; secondary fine sand-sized gypsum crystals segregated in common fine filaments and in seams; strongly effervescent; moderately alkaline; clear smooth boundary.

BCy—45 to 66 inches; pale brown (10YR 6/3) sandy clay loam, brown (10YR 5/3) moist; weak coarse

subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; common few fine and very fine tubular pores; secondary fine sand-sized gypsum crystals segregated in few fine filaments; strongly effervescent; moderately alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 18 to 25 percent

Depth to base of cambic horizon: 12 to 30 inches

A horizon:

Value: 5 or 6 dry, 4 or 5 moist

Bw and Bk horizons:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

Texture: fine sandy loam or loam

Salinity, mmhos/cm: 2 to 4

Sodicity, SAR: 0 to 5

Calcium carbonate equivalent: 5 to 10 percent

By and BC horizons:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

Texture: fine sandy loam and sandy clay loam

Salinity, mmhos/cm: 4 to 8

Sodicity, SAR: 5 to 13

Gypsum content: 1 to 5 percent

Toadlena Series

Classification: Loamy, mixed, mesic, shallow Cambic Gypsiorthids

Depth class: Shallow

Drainage class: Well drained

Permeability: Moderately slow

Landform: Summits and footslopes of structural benches

Parent material: Alluvium and residuum derived from siltstone and shale

Slope range: 2 to 20 percent

Elevation: 6,100 to 6,900 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 50 to 52 degrees F.

Frost-free period: 130 to 150 days

Typical Pedon

Toadlena channery loam, in an area of map unit 317—Toadlena-Eagleeye complex, 2 to 60 percent slopes; San Juan County, New Mexico; about 5.5 miles north-northeast of Toadlena; 1,500 feet west and 2,150 feet north of the southeast corner of sec.

16, T.24N., R.19W.; latitude 36 degrees 18 minutes 45 seconds N and longitude 108 degrees 52 minutes 5 seconds W.

A—0 to 1 inch; light yellowish brown (10YR 6/4) channery loam, yellowish brown (10YR 5/4) moist; moderate very thick platy structure parting to weak fine granular; slightly hard, very friable, slightly sticky and nonplastic; few fine and very fine roots; common very fine vesicular pores; 20 percent channers; secondary sand-sized gypsum crystals segregated in very few fine filaments; strongly effervescent; moderately alkaline; abrupt smooth boundary.

2By1—1 to 5 inches; light yellowish brown (10YR 6/4) gypsiferous material which is an apparent loam, brown (10YR 4/3) moist; moderate fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; few fine and common very fine roots; common very fine irregularly shaped pores; 5 percent soft siltstone fragments; secondary sand-sized gypsum crystals segregated in many fine irregularly shaped soft masses; strongly effervescent; moderately alkaline; abrupt wavy boundary.

2By2—5 to 12 inches; pale brown (10YR 6/3) gypsiferous material which is an apparent loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; few fine and common very fine roots; common very fine irregularly shaped pores; 40 percent soft siltstone fragments; secondary sand-sized gypsum crystals segregated in many medium irregularly shaped accumulations in soft masses and on rock fragments; slightly effervescent; mildly alkaline; clear smooth boundary.

2Cy—12 to 18 inches; light brownish gray (2.5Y 6/2) and light yellowish brown (2/5Y 6/4) silty clay loam, grayish brown (2.5Y 5/2) and light olive brown (2/5Y 5/4) moist; massive, platy rock structure; slightly hard, friable, sticky and plastic; few fine and very fine roots; 70 percent soft shale and siltstone fragments; secondary sand-sized gypsum crystals segregated in few medium irregularly shaped accumulations on rock fragments; slightly effervescent; mildly alkaline; clear wavy boundary.

2Cr—18 inches; interbedded siltstone and shale bedrock.

Range in Characteristics

Soil depth: 10 to 20 inches

Silicate clay content, control section weighted average: 18 to 35 percent

Depth to gypsic horizon: 1 to 3 inches

Reaction: ranges from moderately alkaline in the surface to mildly alkaline in the lower substratum

A horizon:

Hue: 10YR or 2.5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

Rock fragments: total range is 15 to 25 percent; 15 to 20 percent channers,

0 to 5 percent pebbles

Salinity, mmhos/cm: 2 to 4

Sodicity, SAR: 5 to 13

Calcium carbonate equivalent: 5 to 10 percent

2By horizons:

Hue: 10YR or 2.5Y

Value: 5 through 7 dry, 4 or 5 moist

Chroma: 2 through 4

Texture: gypsiferous material which is an apparent loam or clay loam

Salinity, mmhos/cm: 2 to 4

Sodicity, SAR: 5 to 13

Calcium carbonate equivalent: 1 to 10 percent

Gypsum content: 15 to 25 percent

Other features: 5 to 50 percent soft siltstone and shale fragments

2Cy horizon:

Hue: 10YR or 2.5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 through 4

Texture: silty clay loam or clay loam

Salinity, mmhos/cm: 8 to 16

Sodicity, SAR: 5 to 13

Gypsum content: 5 to 15 percent

Other features: 30 to 70 percent soft siltstone and shale fragments

Tocito Series

Classification: Fine-silty, mixed (calcareous), mesic Typic Torriorthents

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately slow

Landform: Low stream terraces and fan terraces

Parent material: Alluvium derived from siltstone and shale

Slope range: 1 to 3 percent

Elevation: 4,800 to 5,300 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Tocito silt loam, in an area of map unit 200—Tocito silt loam, 1 to 3 percent slopes; San Juan County, New Mexico; about 2 miles west of Shiprock; 1,000 feet west and 950 feet north of the southeast corner of sec. 27, T.30N., R.18W.; latitude 36 degrees 46 minutes 49 seconds N and longitude 108 degrees 43 minutes 18 seconds W.

Ap—0 to 6 inches; pale brown (10YR 6/3) silt loam, dark brown (10YR 4/3) moist; weak thick platy structure parting to moderate medium granular; soft, very friable, slightly sticky and slightly plastic; many very fine roots; common very fine tubular pores; strongly effervescent; moderately alkaline; clear smooth boundary.

AB—6 to 12 inches; pale brown (10YR 6/3) clay loam, dark brown (10YR 4/2) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; many fine and common very fine roots; common fine and very fine tubular pores; strongly effervescent; moderately alkaline; clear wavy boundary.

BCy—12 to 16 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; moderate coarse subangular blocky structure; hard, friable, sticky and plastic; common fine and very fine roots; few fine and common very fine tubular pores; secondary silt-sized gypsum crystals segregated in few fine irregularly shaped accumulations on ped faces and as filaments; strongly effervescent; moderately alkaline; clear wavy boundary.

C1—16 to 28 inches; light brownish gray (10YR 6/2) silt loam, brown (10YR 5/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few medium and very fine roots; few fine and common very fine tubular pores; few lamina of very fine sandy loam; secondary silt-sized gypsum crystals segregated in very few fine irregularly shaped filaments; strongly effervescent; moderately alkaline; clear smooth boundary.

C2—28 to 49 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; massive; hard, firm, sticky and plastic; few medium and very fine roots; few fine and very fine tubular pores; few lamina of silt loam; secondary silt-sized gypsum crystals segregated in very few fine irregularly shaped filaments; strongly effervescent; moderately alkaline; clear smooth boundary.

C3—49 to 70 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; massive; hard, firm, sticky and plastic; few very fine roots; few fine and very fine tubular pores; few lamina of silt loam, secondary silt-sized gypsum crystals segregated in very few fine irregularly shaped filaments; strongly effervescent; moderately alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 18 to 35 percent

Reaction: ranges from mildly alkaline in the surface to moderately alkaline in the underlying horizons

A horizon:

Value: 5 or 6 dry, 4 or 5 moist

Texture: silt loam or very fine sandy loam

AB horizon:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 or 3

Texture: clay loam or loam

Salinity, mmhos/cm: 2 to 4

Sodicity, SAR: 0 to 5

Calcium carbonate equivalent: 5 to 10 percent

BCy horizon:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 through 4

Texture: silty clay loam or clay loam

Salinity, mmhos/cm: 2 to 4

Sodicity, SAR: 0 to 5

Calcium carbonate equivalent: 5 to 10 percent

Gypsum content: 1 to 5 percent

C horizons:

Value: 5 through 7 dry, 4 through 6 moist

Chroma: 2 through 4

Texture: stratified very fine sandy loam to silty clay loam

Salinity, mmhos/cm: 4 to 8

Sodicity, SAR: 0 to 13

Calcium carbonate equivalent: 10 to 15 percent

Gypsum content: 1 to 5 percent

Todacheene Series

Classification: Fine-loamy, mixed Pachic Argiborolls

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Footslopes and fan terraces

Parent material: Alluvium derived from basalt and basaltic tuff

Slope range: 5 to 20 percent

Elevation: 8,500 to 9,000 feet

Mean annual precipitation: 20 to 22 inches

Mean annual air temperature: 40 to 42 degrees F.

Frost-free period: 80 to 100 days

Typical Pedon

Todacheene loam, in an area of map unit 706—
Todacheene-Viewpoint-Owlspring complex, 1 to 20
percent slopes; San Juan County, New Mexico; about
9.5 miles west-southwest of Sheep Springs; 2,500
feet west and 1,500 feet north of the southeast corner
of sec. 28, T.22N., R.19W; latitude 36 degrees 6
minutes 30 seconds N and longitude 108 degrees 52
minutes 16 seconds W.

A—0 to 2 inches; very dark gray (5YR 3/1) loam,
black (5YR 2.5/1) moist; moderate thick platy
structure parting to weak medium granular; soft,
very friable, slightly sticky and nonplastic; few
medium and fine, and many very fine roots; few
very fine irregularly shaped pores; slightly acid;
clear smooth boundary.

BA—2 to 6 inches; very dark gray (5YR 3/1) loam,
black (5YR 2.5/1) moist; weak medium prismatic
structure parting to weak medium subangular
blocky; slightly hard, friable, slightly sticky and
slightly plastic; few coarse, few medium, few fine,
and common very fine roots; few very fine
tubular pores; very few thin clay films on faces of
peds; slightly acid; clear smooth boundary.

Bt1—6 to 18 inches; very dark gray (5YR 3/1) loam,
black (5YR 2.5/1) moist; moderate medium
prismatic structure parting to weak medium
subangular blocky; slightly hard, friable, slightly
sticky and slightly plastic; few coarse, few
medium, few fine, and common very fine roots;
few fine and very fine tubular pores; lower part of
horizon contains common thin (1-2 mm thick)
earthworm burrows filled with casts from
underlying horizon; common thin clay films on
faces of peds and lining pores; 5 percent pebbles;
neutral; clear wavy boundary.

Bt2—18 to 23 inches; reddish brown (5YR 5/4) with
dark gray (5YR 4/1) sandy clay loam, reddish
brown (5YR 4/4) with very dark gray (5YR 3/1)
moist; weak medium prismatic structure parting
to moderate medium subangular blocky; slightly
hard, friable, slightly sticky and slightly plastic;
few medium and fine and common very fine
roots; common fine and very fine tubular pores;
common thin (1-2 mm thick) earthworm burrows
filled with casts from overlying horizon; common
thin clay films on faces of peds and lining pores;

5 percent pebbles; neutral; gradual wavy
boundary.

Bt3—23 to 37 inches; reddish brown (5YR 5/4) fine
sandy loam, reddish brown (5YR 4/4) moist;
weak medium prismatic structure parting to
moderate coarse subangular blocky; slightly
hard, friable, slightly sticky and slightly plastic;
few medium and fine and common very fine
roots; common fine and very fine tubular pores;
few thin (2-4 mm thick) earthworm burrows filled
with casts from same horizon; few oval shaped
krotovinas approximately 2 inches in diameter
filled with loam material from the epipedon above;
few moderately thick and common thin clay films
on faces of peds; 5 percent pebbles; neutral;
clear wavy boundary.

2Bt4—37 to 44 inches; brown (7.5YR 5/4) gravelly
sandy loam, brown (7.5YR 4/3) moist; moderate
medium subangular blocky structure; slightly
hard, friable, slightly sticky and nonplastic; few
medium and fine and common very fine roots;
few fine and common very fine tubular pores;
common thin clay films on faces of peds; 15
percent pebbles and 5 percent cobbles; neutral;
clear wavy boundary.

2Bt5—44 to 60 inches; brown (7.5YR 5/4) very
gravelly coarse sandy loam, brown (7.5YR 4/3)
moist; weak medium subangular blocky structure;
soft, very friable, slightly sticky and nonplastic;
few fine and very fine roots; few very fine tubular
pores; common thin clay films bridging sand
grains, few thin clay films on rock fragments; 40
percent pebbles, 10 percent stones, and 5
percent cobbles; neutral; gradual wavy boundary.

2Bt6—60 to 80 inches; brown (7.5YR 5/4) gravelly
sandy loam, brown (7.5YR 4/3) moist; few fine
prominent yellowish red (5YR 4/6) redox
concentrations; weak medium subangular blocky
structure; slightly hard, friable, slightly sticky and
nonplastic; few very fine roots; few very fine
tubular pores; common thin clay films bridging
sand grains and on rock fragments, few thin clay
films on faces of peds; 20 percent pebbles and 10
percent cobbles; neutral.

Range in Characteristics

*Silicate clay content, control section weighted
average:* 18 to 27 percent

Depth to base of mollic epipedon: 16 to 26 inches

Depth of top of argillic horizon: 6 to 11 inches

Reaction: ranges from slightly acid in the surface and
subsurface to neutral in the subsoil

A horizon:*Hue:* 5YR or 7.5YR*Value:* 3 or 4 dry, 2 through 3 moist*Chroma:* 1 through 3**BA and Bt1 horizons:***Hue:* 5YR or 7.5YR*Value:* 3 or 4 dry, 2 through 3 moist*Chroma:* 1 through 3*Texture:* loam or sandy clay loam**Bt2 and Bt3 horizons:***Hue:* 5YR or 7.5YR*Value:* 4 or 5 dry, 3 or 4 moist*Chroma:* 4 through 6*Texture:* sandy clay loam, fine sandy loam, or loam**2Bt horizons:***Hue:* 5YR or 7.5YR*Value:* 5 or 6 dry, 3 or 4 moist*Chroma:* 4 through 6*Texture:* gravelly sandy loam, very gravelly coarse sandy loam, or gravelly sandy clay loam*Clay content:* 10 to 27 percent*Rock fragments:* total range is 20 to 60 percent;

15 to 40 percent pebbles,

5 to 10 percent cobbles,

0 to 10 percent stones

Other features: some pedons have few redox concentrations below 60 inches**Tohatin Series***Classification:* Sandy, mixed, mesic Typic Calciorthids*Depth class:* Very deep*Drainage class:* Somewhat excessively drained*Permeability:* Moderately rapid*Landform:* Treads and risers of dissected fan terraces*Parent material:* Alluvium and eolian material derived from sandstone*Slope range:* 5 to 35 percent*Elevation:* 4,900 to 5,800 feet*Mean annual precipitation:* 5 to 8 inches*Mean annual air temperature:* 54 to 56 degrees F.*Frost-free period:* 150 to 170 days**Typical Pedon**

Tohatin loamy fine sand, in an area of map unit 518—Tohatin-Sheppard loamy fine sands, 5 to 35 percent slopes; Apache County, Arizona; about 6 miles northwest of Totacon (Sweetwater community); 3,700 feet north and 800 feet east of the southwest corner of sec. 32, T.41N., R.27E.; latitude 36 degrees 55 minutes 8 seconds N and longitude 109 degrees 28 minutes 42 seconds W.

A—0 to 3 inches; light reddish brown (5YR 6/4)

loamy fine sand, reddish brown (5YR 4/4) moist; weak medium platy structure parting to moderate medium granular; soft, very friable, nonsticky and nonplastic; few very fine roots; few very fine irregularly shaped pores; 5 percent pebbles and 5 percent cobbles; slightly effervescent; moderately alkaline; clear smooth boundary.

Bk1—3 to 7 inches; reddish yellow (5YR 6/6) loamy fine sand, yellowish red (5YR 4/6) moist; weak coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; few medium and fine and common very fine roots; few fine and very fine tubular pores; 5 percent pebbles; strongly effervescent, secondary calcium carbonate segregated as few fine and medium irregularly shaped accumulations on faces of peds and on rock fragments; moderately alkaline; clear wavy boundary.

Bk2—7 to 18 inches; light reddish brown (5YR 6/4) loamy fine sand, reddish brown (5YR 4/4) moist; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few coarse and medium and common fine and very fine roots; common fine and very fine tubular pores; one thin lense of gravelly loamy fine sand present at about 9 inches; violently effervescent, secondary calcium carbonate segregated as common fine irregularly shaped accumulations on faces of peds and as few large rounded masses; strongly alkaline; clear wavy boundary.

Bk3—18 to 31 inches; light reddish brown (5YR 6/4) loamy fine sand, reddish brown (5YR 4/4) moist; moderate coarse subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; few fine and common very fine roots; few fine and very fine tubular pores; strongly effervescent, secondary calcium carbonate segregated in common coarse seams; strongly alkaline; clear wavy boundary.

BCK—31 to 48 inches; reddish yellow (5YR 6/6) loamy fine sand, yellowish red (5YR 4/6) moist; weak coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; few fine and very fine roots; few fine and very fine tubular pores; strongly effervescent, secondary calcium carbonate segregated as few fine and medium irregularly shaped accumulations on faces of peds and in seams; moderately alkaline; clear smooth boundary.

2Bkb—48 to 59 inches; reddish yellow (5YR 6/6) fine

sandy loam, yellowish red (5YR 4/6) moist; moderate coarse subangular blocky structure; hard, friable, slightly sticky and nonplastic; few fine and very fine roots; few fine and very fine tubular pores; violently effervescent, secondary calcium carbonate segregated as common fine and medium irregularly shaped accumulations on faces of peds and in filaments; strongly alkaline; clear smooth boundary.

2BCKb—59 to 80 inches; reddish yellow (5YR 6/6) loamy fine sand, yellowish red (5YR 4/6) moist; weak coarse subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; few fine and very fine roots; few very fine tubular pores; strongly effervescent, secondary calcium carbonate segregated as few fine irregularly shaped accumulations on faces of peds and in filaments; moderately alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 4 to 10 percent

Depth to calcic horizon: 2 to 6 inches

Reaction: ranges from moderately alkaline in the surface to strongly alkaline in the underlying horizons

A horizon:

Value: 5 or 6 dry

Chroma: 4 through 6

Rock fragments: total range is 0 to 10 percent;

0 to 10 percent pebbles,

0 to 5 percent cobbles, 0 to 1 percent stones

Bk1, Bk2, and Bk3 horizons:

Value: 5 through 8 dry, 4 through 7 moist

Chroma: 2 through 6

Rock fragments: 0 to 10 percent pebbles

Sodicity, SAR: 0 to 5

Calcium carbonate equivalent: 5 to 15 percent

BCK or Bk4 horizons:

Value: 6 or 7 dry, 4 through 6 moist

Chroma: 3 through 6

Texture: loamy fine sand or fine sand

Rock fragments: 0 to 10 percent pebbles

Sodicity, SAR: 0 to 5

Calcium carbonate equivalent: 5 to 10 percent

Bkb and BCKb horizons:

Value: 5 or 6 dry, 4 through 6 moist

Chroma: 3 through 6

Texture: fine sandy loam or loamy fine sand

Rock fragments: less than 5 percent pebbles

Sodicity, SAR: 0 to 5

Calcium carbonate equivalent: 5 to 10 percent

Tohona Series

Classification: Fine, montmorillonitic, mesic Vertic Natrargids

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Slow

Landform: Dipslopes of cuestas and footslopes of mesas

Parent material: Alluvium and residuum derived from shale, claystone, and sandstone

Slope range: 2 to 12 percent

Elevation: 4,700 to 5,400 feet

Mean annual precipitation: 6 to 8 inches

Mean annual air temperature: 52 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Tohona very gravelly sandy clay loam, in an area of map unit 504—Tohona-Kimnoli-Claysprings complex, 2 to 45 percent slopes; San Juan County, New Mexico; about 3 miles southeast of the Four Corners Monument; 1,350 feet south and 700 feet west of the northeast corner of sec. 25, T.32N., R.21W.; latitude 36 degrees 57 minutes 44 seconds N and longitude 109 degrees 0 minutes 31 seconds W.

A—0 to 1 inch; light brown (7.5YR 6/4) very gravelly sandy clay loam, brown (7.5YR 4/3) moist; moderate thick platy structure parting to moderate fine granular; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common fine vesicular pores; 50 percent pebbles and 5 percent cobbles; slightly effervescent; mildly alkaline; abrupt smooth boundary.

2Bt—1 to 4 inches; light reddish brown (5YR 6/4) clay, reddish brown (5YR 5/4) moist; strong medium prismatic structure; very hard, very firm, very sticky and very plastic; few fine and very fine roots; many very fine tubular pores; few thin cracks 6 to 20 mm wide filled with light brown sandy clay loam; common moderately thick clay films on faces of peds and lining pores; 10 percent pebbles; strongly effervescent; strongly alkaline; clear smooth boundary.

2Btkn—4 to 11 inches; light reddish brown (5YR 6/4) clay, reddish brown (5YR 5/4) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, very firm, very sticky and very plastic; few medium and common very fine roots; common very fine tubular pores; few thin clay films on faces of peds and lining pores; 5 percent pebbles; strongly

effervescent, secondary calcium carbonate segregated as few fine and medium irregularly shaped accumulations on faces of peds and in soft masses; strongly alkaline; clear wavy boundary.

3By—11 to 19 inches; light reddish brown (5YR 6/4) with light gray (5Y 7/1) gypsiferous material which is an apparent silty clay loam, yellowish red (5YR 5/6) with light olive gray (5Y 6/2) moist; weak medium prismatic structure parting to moderate coarse subangular blocky; hard, firm, sticky and plastic; few fine and common very fine roots; few very fine tubular pores; 15 percent soft shale fragments; 5 percent pebbles; secondary gypsum crystals segregated in common fine irregularly shaped accumulations on faces of peds and on rock fragments; slightly effervescent; mildly alkaline; clear smooth boundary.

3Cy—19 to 33 inches; light gray (5Y 7/1) gypsiferous material which is an apparent silty clay loam, light olive gray (5Y 6/2) moist; massive, platy rock structure; hard, firm, sticky and plastic; few very fine roots; few very fine irregularly shaped pores; 60 percent soft shale fragments; 10 percent pebbles; secondary gypsum crystals segregated as few, fine and medium, irregularly shaped accumulations on rock fragments; very slightly effervescent; mildly alkaline; clear smooth boundary.

3Cr—33 inches; shale bedrock.

Range in Characteristics

Soil depth: 30 to 40 inches

Silicate clay content, control section weighted average: 40 to 60 percent

Depth to base of natric horizon: 10 to 19 inches

Depth to gypsic horizon: 10 to 24 inches

Reaction: ranges from mildly alkaline in the surface to very strongly alkaline in the subsoil

A horizon:

Value: 5 or 6 dry

Chroma: 3 through 6

Rock fragments: total range is 35 to 60 percent; 30 to 50 percent pebbles, 0 to 10 percent cobbles

B_{tn} and B_{tkn} horizons:

Hue: 5YR or 7.5YR

Value: 5 or 6 dry

Chroma: 4 through 6

Rock fragments: total range is 5 to 15 percent; 5 to 10 percent pebbles,

0 to 5 percent cobbles

Salinity, mmhos/cm: 0 to 4

Sodicity, SAR: 13 to 30

Calcium carbonate equivalent: 5 to 10 percent

By and Cy horizons:

Hue: 2.5YR through 5GY

Value: 6 or 7 dry, 5 or 6 moist

Chroma: 2 through 6

Texture: gypsiferous material which is an apparent silty clay loam or clay loam

Salinity, mmhos/cm: 8 to 16

Sodicity, SAR: 5 to 13

Gypsum content: 15 to 30 percent

Other features: 15 to 70 percent soft shale fragments

Trail Series

Classification: Sandy, mixed, mesic Typic Torrifluvents

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Moderately rapid

Landform: Flood plains and alluvial fans

Parent material: Alluvium derived from sandstone and siltstone

Slope range: 1 to 3 percent

Elevation: 5,000 to 5,400 feet

Mean annual precipitation: 6 to 8 inches

Mean annual air temperature: 52 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Trail loamy fine sand, in an area of map unit 509—Trail loamy fine sand, 1 to 3 percent slopes; Apache County, Arizona; about 7 miles east-northeast of Red Mesa Trading Post; 1,175 feet west and 925 feet north of the southeast corner of sec. 33, T.42N., R.29E.; latitude 36 degrees 59 minutes 47 seconds N and longitude 109 degrees 13 minutes 56 seconds W.

A—0 to 5 inches; reddish brown (5YR 5/4) loamy fine sand, reddish brown (5YR 4/4) moist; moderate medium platy structure parting to weak fine granular; soft, very friable, nonsticky and nonplastic; few very fine roots; few very fine irregularly shaped pores; strongly effervescent; moderately alkaline; abrupt smooth boundary.

C1—5 to 27 inches; stratified light brown (7.5YR 6/4) and light reddish brown (5YR 6/4) fine sand and sand, brown (7.5YR 4/4) and reddish brown (5YR 4/4) moist; single grain; loose, nonsticky and nonplastic; few very fine roots; very slightly effervescent; moderately alkaline; abrupt smooth boundary.

C2—27 to 38 inches; stratified reddish brown (5YR 5/4) and light brown (7.5YR 6/4) loamy fine sand and silt loam, reddish brown (5YR 4/4) and brown (7.5YR 4/4) moist; massive; soft, very friable, slightly sticky and nonplastic; common very fine roots; few fine and common very fine tubular pores; few thin lenses of sand and very fine sandy loam; strongly effervescent; strongly alkaline; abrupt smooth boundary.

C3—38 to 70 inches; stratified light reddish brown (5YR 6/4) sand and fine sand, reddish brown (5YR 4/4) moist; single grain; loose, nonsticky and nonplastic; few very fine roots; slightly effervescent; moderately alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 4 to 8 percent

Reaction: ranges from moderately alkaline in the surface to strongly alkaline in the underlying horizons

A horizon:

Chroma: 3 or 4

C horizons:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 through 6

Texture: stratified sand to silt loam

Salinity, mmhos/cm: 0 to 2

Sodicity, SAR: 0 to 5

Other features: lenses, thin strata, or laminae of sand, very fine sandy loam, fine sandy loam, and silt loam are present

Tsebitai Series

Classification: Coarse-silty, mixed, mesic Typic Camborthids

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Fan terraces

Parent material: Alluvium derived from siltstone and sandstone

Slope range: 1 to 3 percent

Elevation: 5,300 to 5,500 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Tsebitai very fine sandy loam, in an area of map unit 245—Tsebitai very fine sandy loam, 1 to 3 percent

slopes; San Juan County, New Mexico; about 12 miles south of Shiprock; 1,500 feet east and 600 feet south of the northwest corner of sec. 2, T.27N., R.18W.; latitude 36 degrees 36 minutes 36 seconds N and longitude 108 degrees 43 minutes 55 seconds W.

A—0 to 5 inches; pale brown (10YR 6/3) very fine sandy loam, brown (10YR 5/3) moist; moderate very thick platy structure parting to moderate very fine granular; soft, very friable, slightly sticky and nonplastic; few very fine roots; common very fine vesicular pores; strongly effervescent; moderately alkaline; clear smooth boundary.

2Bw1—5 to 16 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few fine and common very fine roots; common very fine random tubular pores; strongly effervescent; moderately alkaline; clear smooth boundary.

2Bw2—16 to 26 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few fine and common very fine roots; common very fine tubular pores; strongly effervescent; secondary calcium carbonate segregated as very few fine filaments; mildly alkaline; clear smooth boundary.

2Bky—26 to 34 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; moderate coarse subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few fine and common very fine roots; few very fine tubular pores; secondary gypsum segregated in common fine filaments; strongly effervescent, secondary calcium carbonate segregated in few fine filaments; mildly alkaline; clear wavy boundary.

2BCKy—34 to 48 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak coarse subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few fine and very fine roots; few very fine tubular pores; secondary gypsum segregated in few fine filaments; strongly effervescent, secondary carbonate segregated in few fine filaments; moderately alkaline; abrupt wavy boundary.

2Cy—48 to 64 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak very thick platy structure; slightly hard, very friable, slightly sticky and nonplastic; few very fine roots;

common very fine tubular pores; secondary gypsum segregated in few fine filaments; strongly effervescent; moderately alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 10 to 18 percent

Rock fragment content, control section weighted average: 0 to 5 percent

Depth to secondary gypsum and base of cambic horizon: 15 to 30 inches

Reaction: ranges from mildly alkaline to moderately alkaline

A horizon:

Chroma: 3 or 4

Salinity, mmhos/cm: 0 to 2

Bw horizons:

Chroma: 3 or 4

Texture: loam or very fine sandy loam

Salinity, mmhos/cm: 0 to 2

Bky horizon:

Hue: 10YR or 2.5Y

Value: 6 or 7 dry

Chroma: 2 through 4

Texture: loam or very fine sandy loam

Salinity, mmhos/cm: 2 to 8

Sodicity, SAR: 0 to 5

Calcium carbonate equivalent: 5 to 10 percent

Gypsum content: 2 to 5 percent

BCKy or C horizons:

Hue: 10YR or 2.5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 through 4

Texture: loam or very fine sandy loam

Salinity, mmhos/cm: 2 to 8

Sodicity, SAR: 0 to 5

Calcium carbonate equivalent: 5 to 10 percent

Gypsum content: 2 to 5 percent

Other features: some pedons have texture of loamy very fine sand or thin horizons of fine sandy loam below 40 inches

Tsezhin Series

Classification: Loamy-skeletal, mixed, mesic Aridic Haplustalfs

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate or moderately slow

Landform: Treads of fan terraces and alluvial cones

Parent material: Alluvium derived from sandstone, shale, and quartz diorite

Slope range: 5 to 70 percent

Elevation: 6,200 to 7,800 feet

Mean annual precipitation: 12 to 16 inches

Mean annual air temperature: 48 to 50 degrees F.

Frost-free period: 120 to 150 days

Typical Pedon

Tsezhin very cobbly very fine sandy loam, extremely stony, in an area of map unit 404—Wetherill-Tsezhin association, 3 to 15 percent slopes; Apache County, Arizona; about 13.5 miles north-northeast of Cove; 1,650 feet west and 1,750 feet north of the southeast corner of sec. 32, T.38N., R.30E.; latitude 36 degrees 44 minutes 32 seconds N and longitude 109 degrees 8 minutes 42 seconds W.

A—0 to 2 inches; reddish brown (5YR 4/4) very cobbly very fine sandy loam, dark reddish brown (5YR 3/4) moist; moderate thick platy structure; soft, friable, slightly sticky and slightly plastic; common fine and very fine roots; few fine irregularly shaped pores; 30 percent cobbles, 20 percent pebbles, and 10 percent stones; very slightly effervescent; neutral; abrupt smooth boundary.

Bt—2 to 7 inches; yellowish red (5YR 4/6) very gravelly clay loam, dark reddish brown (5YR 3/4) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; common medium and few very fine roots; few fine tubular pores; common thin clay films on faces of peds and lining pores; 30 percent pebbles and 10 percent cobbles; very slightly effervescent; neutral; clear smooth boundary.

Btk1—7 to 22 inches; yellowish red (5YR 5/6) very gravelly clay loam, yellowish red (5YR 4/6) moist; moderate medium angular blocky structure; very hard, firm, sticky and plastic; common medium and few very fine roots; common fine tubular pores; common moderately thick clay films on faces of peds and lining pores; 40 percent pebbles and 10 percent cobbles; strongly effervescent, secondary calcium carbonate segregated as very few fine irregularly shaped accumulations on rock fragments; mildly alkaline; abrupt smooth boundary.

Btk2—22 to 35 inches; yellowish red (5YR 5/6) very gravelly clay loam, yellowish red (5YR 4/6) moist; moderate medium angular blocky structure; very hard, firm, sticky and plastic; common fine and few medium roots; common fine tubular pores; many moderately thick clay films on faces of peds and lining pores; 30 percent pebbles and 10

percent cobbles; strongly effervescent, secondary calcium carbonate segregated as very few fine irregularly shaped accumulations on rock fragments; mildly alkaline; clear smooth boundary.

Btk3—35 to 51 inches; yellowish red (5YR 5/6) very cobbly clay loam, yellowish red (5YR 4/6) moist; moderate coarse subangular blocky structure; very hard, firm, sticky and plastic; few fine and medium roots; few fine tubular pores; common moderately thick clay films on faces of peds and lining pores; 30 percent cobbles, 20 percent pebbles, and 5 percent stones; violently effervescent, secondary calcium carbonate segregated as many large irregularly shaped accumulations on rock fragments and as weakly cemented concretions; moderately alkaline; clear smooth boundary.

Btk4—51 to 65 inches; yellowish red (5YR 5/6) very cobbly clay loam, yellowish red (5YR 4/6) moist; moderate coarse subangular blocky structure; hard, firm, sticky and plastic; few fine and very fine roots; few fine tubular pores; few thin clay films on faces of peds and lining pores; 30 percent cobbles, 15 percent pebbles, and 5 percent stones; strongly effervescent, secondary calcium carbonate segregated as common medium irregularly shaped accumulations on rock fragments and faces of peds; mildly alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 20 to 35 percent

Depth to base of argillic horizon: 30 to 60 inches

Depth to calcic horizon: 23 to 36 inches

Reaction: ranges from neutral in the surface to moderately alkaline in the substratum

A horizon:

Hue: 5YR or 7.5YR

Value: 3 or 4 moist

Texture: very cobbly very fine sandy loam or extremely cobbly very fine sandy loam

Rock fragments: total range is 35 to 75 percent; 10 to 20 percent pebbles, 20 to 35 percent cobbles, 5 to 20 percent stones or boulders

Bt and upper Btk horizons:

Hue: 2.5YR or 5YR

Value: 4 through 6 dry, 3 through 5 moist

Chroma: 4 through 6

Texture: very gravelly clay loam, very gravelly sandy

clay loam, very cobbly sandy clay loam, or very cobbly clay loam

Rock fragments: total range is 35 to 60 percent; 15 to 40 percent pebbles, 10 to 30 percent cobbles, 0 to 5 percent stones

Calcium carbonate equivalent, <2 mm: 1 to 10 percent

Lower Btk and Bk horizons:

Hue: 2.5YR or 5YR

Value: 5 through 8 dry, 4 through 7 moist

Chroma: 2 through 6

Texture: very cobbly clay loam or very cobbly sandy clay loam

Rock fragments: total range is 35 to 60 percent; 15 to 25 percent pebbles, 20 to 30 percent cobbles, 0 to 5 percent stones

Calcium carbonate equivalent, <2 mm: 15 to 35 percent in the calcic horizon, 3 to 10 percent below

Tunitcha Series

Classification: Fine-loamy, mixed Mollic Eutroboralfs

Depth class: Deep

Drainage class: Well drained

Permeability: Moderate

Landform: Backslopes of high plateaus, mesas, and structural benches

Parent material: Colluvium and residuum derived from sandstone

Slope range: 45 to 60 percent

Elevation: 8,500 to 9,200 feet

Mean annual precipitation: 20 to 24 inches

Mean annual air temperature: 39 to 41 degrees F.

Frost-free period: 60 to 90 days

Typical Pedon

Tunitcha very flaggy sandy loam, in an area of map unit 708—Tunitcha-Bangston association, 35 to 60 percent slopes; San Juan County, New Mexico; about 10 miles northwest of Toadlena; 1,650 feet east and 2,275 feet north of the southwest corner of sec. 12, T.24N., R.21W.; latitude 36 degrees 19 minutes 40 seconds N and longitude 109 degrees 2 minutes 15 seconds W.

Soil surface is covered by 1 inch of pine needles, twigs, and cones; abrupt smooth boundary.

A—0 to 5 inches; dark grayish brown (10YR 4/2) very flaggy sandy loam, very dark brown (10YR 2/2)

moist; weak medium subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly sticky and nonplastic; common very fine roots; few very fine irregularly shaped and tubular pores; 30 percent flagstones and 20 percent pebbles; neutral; clear smooth boundary.

BA—5 to 8 inches; brown (7.5YR 4/2) flaggy sandy loam, dark brown (7.5YR 3/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common very fine and few medium roots; common very fine tubular pores; 20 percent flagstones and 10 percent pebbles; neutral; clear smooth boundary.

2Bt1—8 to 25 inches; reddish brown (5YR 5/5) sandy clay loam; reddish brown (5YR 4/4) moist; moderate coarse parting to moderate fine subangular blocky structure; hard, friable, sticky and slightly plastic; common very fine and fine roots; few very fine tubular pores; many thin clay films on faces of peds and lining pores; slightly acid; gradual smooth boundary.

2Bt2—25 to 38 inches; brown (7.5YR 5/4) sandy clay loam, dark brown (7.5YR 4/4) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine and few coarse roots; few very fine tubular pores; common thin clay films on faces of peds; neutral; abrupt wavy boundary.

2C/Bt—38 to 50 inches; white (10YR 8/2) (C part) and light brown (7.5YR 6/4) (Bt part) sandy loam, pale brown (10YR 6/3) and brown (7.5YR 4/4) moist; massive, platy rock structure; very hard, very firm, slightly sticky and nonplastic; few coarse and common very fine roots; few thin clay films on rock fragments; 25 percent soft sandstone fragments; neutral; abrupt smooth boundary.

2C—50 to 57 inches; white (10YR 8/2) sandy loam, brown (10YR 5/3) moist; massive, platy rock structure; slightly hard, very friable, slightly sticky and nonplastic; few medium and very fine roots; few very fine tubular pores; 15 percent soft sandstone fragments; neutral; clear smooth boundary.

2Cr—57 inches; soft sandstone bedrock.

Range in Characteristics

Soil depth: 40 to 60 inches

Silicate clay content, control section weighted average: 20 to 27 percent

Depth to base of argillic horizon: 30 to 42 inches

Reaction: ranges from slightly acid to neutral

A horizon:

Hue: 7.5YR or 10YR

Value: 3 through 5 dry, 2 or 3 moist

Chroma: 2 or 3

Rock fragments: total range is 35 to 60 percent;

10 to 20 percent pebbles,

5 to 10 percent channers (0 to 5 percent are longer than 3 inches),

20 to 30 percent flagstones (0 to 5 percent are longer than 10 inches)

BA horizon:

Value: 4 through 6 dry, 3 or 4 moist

Chroma: 1 through 4

Rock fragments: total range is 15 to 35 percent;

5 to 10 percent pebbles,

10 to 25 percent flagstones

2Bt horizons:

Hue: 5YR or 7.5YR

Value: 4 through 6 dry, 3 through 5 moist

Chroma: 3 through 6

Rock fragments: total range is 0 to 15 percent;

0 to 10 percent pebbles,

0 to 5 percent flagstones

Other features: 0 to 15 percent soft sandstone fragments

2C/Bt horizon:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 4 through 6 moist

Chroma: 2 through 6

Texture: sandy loam or fine sandy loam

Other features: 5 to 25 percent soft sandstone fragments

2C horizon:

Hue: 7.5YR or 10YR

Value: 6 through 8 dry, 5 or 6 moist

Chroma: 2 through 4

Texture: sandy loam or fine sandy loam

Other features: 10 to 30 percent soft sandstone fragments

Tuntsa Series

Classification: Coarse-loamy, mixed Pachic Haploborolls

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately rapid

Landform: Toeslopes and footslopes of stable landslides

Parent material: Alluvium derived from basalt and sandstone

Slope range: 3 to 15 percent

Elevation: 7,600 to 8,600 feet

Mean annual precipitation: 18 to 20 inches

Mean annual air temperature: 42 to 45 degrees F.

Frost-free period: 90 to 110 days

Typical Pedon

Tuntsa fine sandy loam, in an area of map unit 614—Kunz-Tuntsa-Yahmore complex, 3 to 45 percent slopes; San Juan County, New Mexico; about 8 miles northwest of Sanostee; 600 feet east and 950 feet south of the northwest corner of sec. 20, T.26N., R.20W.; latitude 36 degrees 28 minutes 41 seconds N and longitude 109 degrees 0 minutes 13 seconds W.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) fine sandy loam, very dark brown (10YR 2/2) moist; moderate medium platy structure parting to moderate medium granular; soft, very friable, slightly sticky and nonplastic; few fine and many very fine roots; common very fine irregularly shaped pores; neutral; abrupt smooth boundary.

BA—3 to 9 inches; very dark gray (10YR 3/1) fine sandy loam, black (10YR 2/1) moist; moderate medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few fine and common very fine roots; few fine tubular pores and common very fine interstitial pores; 5 percent pebbles; neutral; clear smooth boundary.

Bw1—9 to 24 inches; very dark gray (10YR 3/1) fine sandy loam; black (10YR 2/1) moist; moderate coarse subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; few fine and many very fine roots; few fine and common very fine tubular pores; 5 percent pebbles; neutral; gradual smooth boundary.

Bw2—24 to 36 inches; dark gray (10YR 4/1) fine sandy loam; black (10YR 2/1) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and nonplastic; few fine and common very fine roots; common fine and few very fine tubular pores; 5 percent pebbles; neutral; gradual smooth boundary.

Bw3—36 to 45 inches; dark grayish brown (10YR 4/2) fine sandy loam; very dark brown (10YR 2/2) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and nonplastic; common very fine roots; common fine

and very fine tubular pores; 5 percent pebbles; neutral; gradual smooth boundary.

Bw4—45 to 63 inches; brown (10YR 5/4) fine sandy loam; dark yellowish brown (10YR 3/4) moist; moderate coarse subangular blocky structure; hard, friable, slightly sticky and nonplastic; common very fine roots; common fine and very fine tubular pores; 5 percent pebbles; neutral.

Range in Characteristics

Silicate clay content, control section weighted average: 8 to 18 percent

Depth to base of mollic epipedon: 18 to 50 inches

A horizon:

Hue: 7.5YR or 10YR

Value: 3 or 4 dry, 2 or 3 moist

Chroma: 1 or 2

BA and Bw horizons:

Hue: 7.5YR or 10YR

Value: 3 through 5 dry, 2 through 4 moist

Chroma: 1 through 4

Texture: fine sandy loam or loam

Rock fragments: 0 to 5 percent pebbles

BC and C horizons:

Hue: 7.5YR or 10YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 2 through 4

Texture: fine sandy loam or loam

Rock fragments: 0 to 5 percent pebbles

Tyende Series

Classification: Coarse-loamy, mixed, mesic Typic Natrargids

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Moderate

Landform: Summits of structural benches

Parent material: Eolian material, alluvium, and residuum derived from sandstone and siltstone

Slope range: 1 to 3 percent

Elevation: 5,000 to 5,500 feet

Mean annual precipitation: 6 to 8 inches

Mean annual air temperature: 52 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Tyende loamy fine sand, in an area of map unit 523—Tyende-Aneth-Shumbegay loamy fine sands, 1 to 25 percent slopes; Apache County, Arizona; about 10 miles north of Rock Point; 1,950 feet south and 400 feet east of the northwest corner of sec. 3, T.39N.,

R.25E.; latitude 36 degrees 49 minutes 7 seconds N and longitude 109 degrees 38 minutes 23 seconds W.

A—0 to 6 inches; yellowish red (5YR 5/6) loamy fine sand, yellowish red (5YR 4/6) moist; weak medium platy structure parting to weak fine granular; soft, very friable, nonsticky and nonplastic; common fine and very fine roots; few very fine irregularly shaped pores; very slightly effervescent; moderately alkaline; abrupt smooth boundary.

2Bt_n—6 to 10 inches; red (2.5YR 5/6) fine sandy loam, red (2.5YR 4/6) moist; weak medium prismatic structure parting to moderate fine subangular blocky; hard, friable, slightly sticky and nonplastic; few fine and common very fine roots; few very fine tubular pores; few thin clay films on faces of peds and lining pores; slightly effervescent, secondary calcium carbonate segregated as very few fine irregularly shaped filaments; strongly alkaline; abrupt irregular boundary.

2Bt_{kn}—10 to 14 inches; light red (2.5YR 6/6) sandy clay loam, red (2.5YR 4/6) moist; moderate medium prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky and slightly plastic; few fine and common very fine roots; common fine and few very fine tubular pores; common thin clay films on faces of peds and lining pores; strongly effervescent, secondary calcium carbonate segregated as few fine and medium irregularly shaped accumulations on faces of peds; strongly alkaline; clear smooth boundary.

3Bt_{kz}—14 to 18 inches; light red (2.5YR 6/6) very fine sandy loam, red (2.5YR 4/6) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and nonplastic; common very fine roots; few fine and very fine tubular pores; 10 percent soft siltstone fragments; few thin clay films on faces of peds and lining pores; very fine sand-sized salt crystals segregated in few fine filaments; strongly effervescent, secondary calcium carbonate segregated as few fine and medium irregularly shaped accumulations on faces of peds; strongly alkaline; clear wavy boundary.

3Bk_z—18 to 28 inches; light reddish brown (2.5YR 6/4) with light red (2.5YR 6/6) very fine sandy loam, reddish brown (2.5YR 4/4) with red (2.5YR 4/6) moist; moderate very thick platy structure

parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and nonplastic; common very fine roots; few very fine irregularly shaped pores; 40 percent soft sandstone and siltstone fragments; very fine sand-sized salt crystals segregated in few fine and medium irregularly shaped accumulations on faces of peds and as filaments; strongly effervescent, secondary calcium carbonate segregated as common medium irregularly shaped accumulations in seams and on faces of peds; strongly alkaline; clear wavy boundary.

3Ck—28 to 37 inches; light reddish brown (2.5YR 6/4) fine sandy loam, reddish brown (2.5YR 5/4) moist; massive, platy rock structure; slightly hard, friable, slightly sticky and nonplastic; few very fine roots; few very fine irregularly shaped pores; 80 percent soft sandstone fragments; very fine sand-sized salt and gypsum crystals segregated in very few fine irregularly shaped accumulations on rock fragments; strongly effervescent, secondary calcium carbonate segregated as few fine and medium irregularly shaped accumulations on rock fragments; strongly alkaline; clear wavy boundary.

3Cr—37 inches; soft sandstone bedrock.

Range in Characteristics

Soil depth: 20 to 40 inches

Silicate clay content, control section weighted average: 10 to 18 percent

Depth to base of natric horizon: 18 to 28 inches

Depth to calcic horizon: 9 to 23 inches

Reaction: ranges from mildly alkaline in the surface to very strongly alkaline in the subsoil

A horizon:

Value: 5 or 6 dry, 4 or 5 moist

Bt_n horizon:

Hue: 2.5YR or 5YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 6 through 8

Salinity, mmhos/cm: 2 to 8

Sodicity, SAR: 30 to 40

Bt_{kn} horizon:

Hue: 2.5YR or 5YR

Value: 5 or 6 dry

Chroma: 4 through 6

Texture: sandy clay loam or very fine sandy loam

Clay content: 18 to 24 percent

Salinity, mmhos/cm: 8 to 16

Sodicity, SAR: 30 to 60

Calcium carbonate equivalent: 5 to 10 percent

Btkz or Bkz horizons:

Hue: 2.5YR or 5YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 through 6

Texture: very fine sandy loam or fine sandy loam

Salinity, mmhos/cm: 12 to 20

Sodicity, SAR: 30 to 60

Calcium carbonate equivalent: 10 to 15 percent

Other features: 10 to 50 percent soft sandstone and siltstone fragments

Ck horizon:

Hue: 2.5YR or 5YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 through 6

Texture: very fine sandy loam or fine sandy loam

Salinity, mmhos/cm: 8 to 25

Sodicity, SAR: 30 to 60

Calcium carbonate equivalent: 5 to 10 percent

Gypsum content: 0 to 1 percent

Other features: 25 to 80 percent soft sandstone and siltstone fragments

Uzaneva Series

Classification: Fine, montmorillonitic, mesic Haplic Natrargids

Depth class: Very deep

Drainage class: Well drained

Permeability: Very slow

Landform: Low stream terraces

Parent material: Alluvium derived from shale, siltstone, and sandstone

Slope range: 0 to 2 percent

Elevation: 4,700 to 5,200 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 52 to 56 degrees F.

Frost-free period: 140 to 170 days

Typical Pedon

Uzaneva clay loam, in an area of map unit 524—Uzaneva clay loam, 0 to 2 percent slopes; Apache County, Arizona; about 9 miles south of Rock Point; 500 feet south and 250 feet west of the northeast corner of sec. 26, T.37N., R.25E.; latitude 36 degrees 35 minutes 28 seconds N and longitude 109 degrees 36 minutes 21 seconds W.

A—0 to 1 inch; reddish brown (2.5YR 5/4) clay loam, reddish brown (2.5YR 4/4) moist; strong thick platy structure parting to moderate very fine granular; soft, very friable, sticky and plastic; few fine and very fine roots; few very fine vesicular

pores; strongly effervescent; moderately alkaline; clear smooth boundary.

Bt1—1 to 3 inches; reddish brown (2.5YR 5/4) clay, reddish brown (2.5YR 5/4) moist; moderate medium prismatic structure parting to weak medium platy; hard, friable, very sticky and plastic; few fine and very fine roots; few very fine tubular pores; common thin cracks 2 to 10 mm wide filled with yellowish red loamy fine sand; few thin clay films on faces of peds and lining pores; slightly effervescent; strongly alkaline; clear smooth boundary.

Bt2—3 to 13 inches; reddish brown (2.5YR 5/4) clay, reddish brown (2.5YR 4/4) moist; moderate medium prismatic structure parting to strong medium subangular blocky; very hard, firm, very sticky and very plastic; few medium and fine, and common very fine roots; few very fine tubular pores; common thin cracks 2 to 10 mm wide filled with yellowish red loamy fine sand; few moderately thick clay films on faces of peds, and common thin clay films on faces of peds and lining pores; strongly effervescent, strongly alkaline; clear wavy boundary.

Btn—13 to 25 inches; light reddish brown (2.5YR 6/4) silty clay loam, reddish brown (2.5YR 5/4) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable, sticky and plastic; few fine and common very fine roots; few fine and very fine tubular pores; few lamina of fine sandy loam and silt loam; few thin cracks 1 to 5 mm wide filled with reddish brown clay; common thin clay films on faces of peds and lining pores; strongly effervescent; strongly alkaline; abrupt wavy boundary.

C/Btn—25 to 39 inches; light reddish brown (5YR 6/3) with reddish brown (2.5YR 5/4) silty clay loam, reddish brown (5YR 5/3) with (2.5YR 4/4) moist; massive; hard, friable, sticky and plastic; few fine and very fine roots; few fine and very fine tubular pores; few lamina of fine sandy loam and silt loam; few thin cracks 0.5 to 2 mm wide; few thin clay films lining cracks; secondary silt-sized gypsum crystals segregated in very few fine filaments; strongly effervescent; strongly alkaline; gradual smooth boundary.

C1—39 to 62 inches; light reddish brown (5YR 6/4) silty clay loam, reddish brown (5YR 4/4) moist; massive; hard, friable, sticky and plastic; few fine and very fine roots; common very fine tubular

pores; few thin strata of very fine sandy loam; strongly effervescent; strongly alkaline; clear smooth boundary.

C2—62 to 70 inches; reddish brown (2.5YR 5/4) silty clay, reddish brown (2.5YR 4/4) moist; massive; very hard, firm, very sticky and very plastic; few fine and very fine roots; few very fine tubular pores; few thin strata of sandy clay loam; strongly effervescent; strongly alkaline; clear smooth boundary.

C3—70 to 80 inches; light reddish brown (5YR 6/4) silty clay loam, reddish brown (5YR 4/4) moist; massive; hard, friable, sticky and plastic; few fine and very fine roots; few very fine tubular pores; few lenses of very fine sandy loam; strongly effervescent; strongly alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 35 to 55 percent

Depth to base of natric horizon: 11 to 25 inches

Reaction: ranges from moderately alkaline in the surface to strongly alkaline in the subsoil and substratum

A horizon:

Hue: 2.5YR or 5YR

Bt1 and Bt2 horizons:

Hue: 2.5YR or 5YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 or 4

Texture: clay or clay loam

Salinity, mmhos/cm: 0 to 2

Sodicity, SAR: 5 to 13

Btn horizon:

Hue: 2.5YR or 5YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 3 or 4

Texture: silty clay loam, silty clay, or clay

Salinity, mmhos/cm: 2 to 4

Sodicity, SAR: 13 to 30

Gypsum content: 0 to 2 percent

C horizons:

Hue: 2.5YR through 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 through 4

Texture: stratified sandy loam to silty clay

Salinity, mmhos/cm: 2 to 4

Sodicity, SAR: 13 to 30

Gypsum content: 0 to 2 percent

Other features: some pedons have thin subhorizons with hue of 2.5Y

Vessilla Series

Classification: Loamy, mixed (calcareous), mesic Lithic Ustorthents

Depth class: Very shallow

Drainage class: Well drained

Permeability: Moderately rapid

Landform: Summits of structural benches and dipslopes of cuestas

Parent material: Alluvium and eolian material derived from sandstone

Slope range: 5 to 25 percent

Elevation: 6,500 to 7,800 feet

Mean annual precipitation: 12 to 16 inches

Mean annual air temperature: 48 to 50 degrees F.

Frost-free period: 130 to 150 days

Typical Pedon

Vessilla channery fine sandy loam, in an area of map unit 401—Vessilla-Rock outcrop complex, 5 to 25 percent slopes; San Juan County, New Mexico; about 16 miles northeast of Shiprock; 250 feet east and 200 feet north of the southwest corner of sec. 9, T.32N., R.16W.; latitude 36 degrees 59 minutes 44 seconds N and longitude 108 degrees 32 minutes 16 seconds W.

A—0 to 3 inches; light brown (7.5YR 6/4) channery fine sandy loam, brown (7.5YR 4/4) moist; moderate very thick platy structure parting to weak fine granular; soft, very friable, slightly sticky and nonplastic; few coarse and very fine roots; few very fine vesicular pores; a moderately developed black cryptogam crust is on the soil surface; 10 percent channers, 5 percent flagstones, and 5 percent pebbles; slightly effervescent; mildly alkaline; clear smooth boundary.

BC—3 to 8 inches; light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 4/4) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; common medium and very fine roots; 5 percent soft sandstone fragments; 5 percent channers and 5 percent pebbles; strongly effervescent, secondary calcium carbonates segregated as very few fine irregularly shaped accumulations on rock fragments and sand grains; moderately alkaline; abrupt wavy boundary.

2R—8 inches; sandstone bedrock.

Range in Characteristics

Soil depth: 4 to 10 inches

Silicate clay content, control section weighted

average: 10 to 18 percent

Reaction: ranges from mildly alkaline in the surface to moderately alkaline in the underlying horizon

A horizon:

Hue: 7.5YR or 10YR

Value: 5 or 6

Chroma: 3 or 4

Rock fragments: total range is 15 to 25 percent

5 to 10 percent pebbles,

5 to 10 percent channers (0 to 10 percent are longer than 3 inches),

0 to 5 percent flagstones (longer than 10 inches)

BC horizon:

Hue: 7.5YR or 10YR

Value: 4 through 6 dry

Chroma: 2 through 4

Texture: fine sandy loam or channery fine sandy loam

Rock fragments: total range is 5 to 20 percent;

0 to 5 percent pebbles,

5 to 15 percent channers (0 to 5 percent are longer than 3 inches)

Calcium carbonate equivalent: 5 to 20 percent

Other features: 5 to 10 percent soft sandstone fragments

Viewpoint Series

Classification: Loamy, mixed Lithic Argiborolls

Depth class: Shallow

Drainage class: Well drained

Permeability: Moderate

Landform: Shoulders and knolls of mesas and calderas; and shoulders of hills, buttes, and escarpments

Parent material: Alluvium, colluvium, and residuum derived from basalt and tuff-breccia

Slope range: 2 to 35 percent

Elevation: 8,200 to 9,800 feet

Mean annual precipitation: 20 to 24 inches

Mean annual air temperature: 39 to 42 degrees F.

Frost-free period: 60 to 100 days

Typical Pedon

Viewpoint gravelly loam, very stony, in an area of map unit 706—Todacheene-Viewpoint-Owlspring association, 1 to 20 percent slopes; San Juan County, New Mexico; about 9.5 miles west-southwest of Sheep Springs; 750 feet north and 2,000 feet

west of the southeast corner of sec. 28, T.22N., R.19W.; latitude 36 degrees 6 minutes 23 seconds N and longitude 108 degrees 52 minutes 10 seconds W.

Soil surface is covered by 1 inch of pine needles, twigs, and cones; abrupt smooth boundary.

A—0 to 3 inches; dark brown (7.5YR 4/2) gravelly loam, very dark brown (7.5YR 2/2) moist; weak thick platy structure parting to moderate medium granular; soft, very friable, slightly sticky and nonplastic; few fine and common very fine roots; common very fine irregularly shaped pores; 15 percent pebbles and 2 percent stones; slightly acid; clear smooth boundary.

Bt1—3 to 7 inches; dark brown (7.5YR 4/3) gravelly sandy clay loam, dark brown (7.5YR 3/2) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few coarse, few medium, few fine, and common very fine roots; few very fine tubular pores; few thin clay films on faces of peds; 25 percent pebbles and 5 percent cobbles; neutral; clear wavy boundary.

2Bt2—7 to 17 inches; dark brown (7.5YR 4/3) cobbly sandy clay loam, dark brown (7.5YR 3/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few coarse, few medium, few fine, and few very fine roots; few very fine tubular pores; common thin clay films on faces of peds and on rock fragments; 15 percent cobbles, 15 percent pebbles, and 5 percent stones; clear wavy boundary.

2R—17 inches; basalt bedrock.

Range in Characteristics

Soil depth: 10 to 20 inches

Silicate clay content, control section weighted

average: 20 to 35 percent

Sand content: 35 to 65 percent medium and coarser sand

Rock fragments, control section weighted average: 15 to 35 percent

Depth to base of argillic horizon: 10 to 20 inches

Reaction: ranges from slightly acid in the surface to neutral in the subsoil

A horizon:

Hue: 5YR or 7.5YR

Value: 3 or 4 dry, 2 or 3 moist

Chroma: 1 or 2

Texture: gravelly loam or very gravelly loam

Rock fragments: total range is 15 to 60 percent;
15 to 35 percent pebbles,
0 to 15 percent cobbles,
0.5 to 10 percent stones and boulders

Bt1 horizon:

Hue: 5YR or 7.5YR

Value: 3 through 5 dry, 2 or 3 moist

Chroma: 2 or 3

Texture: gravelly loam or gravelly sandy clay loam

Clay content: 18 to 27 percent

Rock fragments: total range is 30 to 35 percent;
20 to 30 percent pebbles,
0 to 10 percent cobbles

2Bt2 horizon:

Hue: 5YR or 7.5YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 2 or 3

Texture: cobbly sandy clay loam, gravelly clay loam,
or gravelly sandy clay loam

Clay content: 20 to 35 percent

Rock fragments: total range is 30 to 35 percent;
15 to 30 percent pebbles,
0 to 15 percent cobbles,
0 to 5 percent stones

Vosburg Series

Classification: Fine-loamy, mixed, mesic Pachic
Argiustolls

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Toeslopes of stable landslides

Parent material: Alluvium derived from sandstone and
shale

Slope range: 1 to 5 percent

Elevation: 6,800 to 7,800 feet

Mean annual precipitation: 12 to 16 inches

Mean annual air temperature: 48 to 50 degrees F.

Frost-free period: 120 to 140 days

Typical Pedon

Vosburg loam, in an area of map unit 407—Iwela-Nomrah-Vosburg complex, 1 to 40 percent slopes; San Juan County, New Mexico; about 6 miles southwest of Sheep Springs; 250 feet east and 975 feet north of the southwest corner of sec. 30, T.22N., R.18W.; latitude 36 degrees 6 minutes 25 seconds N and longitude 108 degrees 48 minutes 29 seconds W.

A—0 to 4 inches; dark brown (7.5YR 4/3) loam, (7.5YR 3/2) moist; moderate thick platy structure parting to moderate fine granular; soft, very

friable, slightly sticky and slightly plastic; common fine and few medium and very fine roots; few very fine irregularly shaped pores; slightly acid; clear smooth boundary.

AB—4 to 7 inches; dark brown (7.5YR 4/3) loam, (7.5YR 3/3) moist; weak coarse subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common fine and few medium and very fine roots; few fine tubular and few very fine irregularly shaped pores; slightly acid; clear smooth boundary.

Bt1—7 to 17 inches; dark brown (7.5YR 4/3) clay loam, (7.5YR 3/2) moist; weak coarse prismatic structure parting to moderate coarse subangular blocky; hard, friable, sticky and plastic; common medium and few fine and very fine roots; common fine and few very fine tubular pores; few thin clay films on faces of peds and lining pores; neutral; gradual smooth boundary.

Bt2—17 to 36 inches; dark brown (7.5YR 4/2) clay loam, (7.5YR 2/2) moist; weak coarse prismatic structure parting to strong coarse subangular blocky; hard, friable, sticky and plastic; few medium and common fine and very fine roots; common fine and few medium and very fine tubular pores; many thin clay films on faces of peds and lining pores; neutral; clear smooth boundary.

Btk1—36 to 46 inches; brown (7.5YR 5/3) sandy clay loam, (7.5YR 3/3) moist; moderate coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine and common very fine roots; few coarse and medium and common fine and very fine tubular pores; common thin clay films on faces of peds and lining pores; slightly effervescent, secondary calcium carbonates segregated as few fine irregularly shaped accumulations on faces of peds and as filaments; mildly alkaline; clear wavy boundary.

Btk2—46 to 65 inches; brown (7.5YR 5/3) sandy clay loam, (7.5YR 3/3) moist; moderate coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine and common very fine roots; few medium and fine and common very fine tubular pores; few thin clay films on faces of peds and lining pores; strongly effervescent, secondary calcium carbonates segregated as common fine and medium irregularly shaped accumulations on faces of peds; mildly alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 20 to 35 percent

Depth to base of argillic horizon: 40 to 60 inches or more

Depth to base of mollic epipedon: 20 to 60 inches or more

Reaction: ranges from slightly acid in the surface to mildly alkaline in the lower subsoil

A and AB horizons:

Hue: 7.5YR or 10YR

Value: 3 through 5 dry, 2 or 3 moist

Chroma: 2 or 3

Bt horizons:

Hue: 7.5YR or 10YR

Value: 3 through 5 dry, 2 through 4 moist

Chroma: 2 through 4

Texture: clay loam or sandy clay loam

Btk or Bk horizons:

Hue: 5YR through 10YR

Value: 4 through 6 dry, 2 through 5 dry

Chroma: 1 through 6

Texture: sandy clay loam or clay loam

Calcium carbonate equivalent: 1 to 3 percent

Walrees Series

Classification: Fine-loamy over sandy or sandy-skeletal, mixed (calcareous), mesic Oxyaquic Ustifluvents

Depth class: Very deep

Drainage class: Somewhat poorly drained

Permeability: Moderately slow in upper part, very rapid in lower part

Landform: Intermittent channels of low flood plains

Parent material: Alluvium derived from sandstone, shale, and quartzite

Slope range: 0 to 1 percent

Elevation: 4,600 to 5,000 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Walrees fine sandy loam, in an area of map unit 142—Bebeevar-Walrees complex, 0 to 2 percent slopes; San Juan County, New Mexico; about 3 miles east of Shiprock; 2,500 feet south and 150 feet east of the northwest corner of sec. 34, T.30N., R.17W.; latitude 36 degrees 46 minutes 16 seconds N and longitude 108 degrees 37 minutes 39 seconds W.

AC—0 to 4 inches; pale brown (10YR 6/3) fine sandy loam, dark grayish brown (10YR 4/2) moist; few fine faint dark yellowish brown (10YR 4/4) redox concentrations; weak medium platy structure parting to weak fine granular; soft, very friable, slightly sticky and nonplastic; common fine and very fine roots; few very fine irregularly shaped pores; few lenses of loamy fine sand; slightly effervescent; moderately alkaline; clear wavy boundary.

C1—4 to 12 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; few fine distinct dark yellowish brown (10YR 4/6) redox concentrations; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common medium and few coarse and very fine roots; few fine tubular and few very fine irregularly shaped pores; strongly effervescent; moderately alkaline; clear wavy boundary.

C2—12 to 17 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 5/3) moist; few fine distinct dark yellowish brown (10YR 4/6) redox concentrations; massive; soft, very friable, nonsticky and nonplastic; common fine and few coarse and very fine roots; common very fine tubular pores; few lenses of silt loam; slightly effervescent; moderately alkaline; clear wavy boundary.

C3—17 to 23 inches; light brownish gray (10YR 6/2) fine sandy loam, grayish brown (10YR 5/2) moist; common fine distinct dark yellowish brown (10YR 4/6) and few fine prominent strong brown (7.5YR 4/6) redox concentrations; massive; soft, very friable, slightly sticky and nonplastic; common fine and few coarse and very fine roots; common very fine tubular pores; few lenses of silt loam; slightly effervescent; moderately alkaline; clear smooth boundary.

C4—23 to 30 inches; light brownish gray (10YR 6/2) silt loam, grayish brown (10YR 5/2) moist; common medium distinct dark yellowish brown (10YR 4/6) and few fine prominent strong brown (7.5YR 4/6) redox concentrations; massive; slightly hard, friable, slightly sticky and slightly plastic; common fine and few medium and very fine roots; few very fine tubular pores; few thin strata of silty clay loam containing few fine faint dark gray (10YR 4/1) redox depletions; strongly effervescent; moderately alkaline; clear wavy boundary.

2C5—30 to 62 inches; light brownish gray (10YR 6/2) stratified very gravelly coarse sand and sand,

dark grayish brown (10YR 4/2) moist; few fine faint dark yellowish brown (10YR 4/4) redox concentrations; single grain; loose, nonsticky and nonplastic; few medium and fine roots; 5 to 40 percent pebbles, 0 to 5 percent cobbles, and 0 to 5 percent stones; very slightly effervescent; moderately alkaline.

Range in Characteristics

Depth to major lithologic discontinuity of sandy material: 20 to 40 inches

Silicate clay content, control section weighted average: 18 to 27 percent in upper part and 0 to 5 percent in lower part

Depth to seasonal high water table: 2.0 to 3.5 feet

AC horizon:

Value: 5 or 6 dry

Chroma: 2 or 3

Salinity, mmhos/cm: 4 to 8

Sodicity, SAR: 0 to 5

Redoximorphic features: none to common, fine, faint to prominent, dark yellowish brown, strong brown, or yellowish red redox concentrations

Other features: lenses of loamy fine sand, very fine sandy loam, or silt loam are present

C horizons:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 or 3

Texture: stratified loamy fine sand to silty clay loam

Salinity, mmhos/cm: 4 to 8

Sodicity, SAR: 0 to 5

Redoximorphic features: few to many, fine to medium, distinct or prominent, dark yellowish brown or strong brown redox concentrations

Other features: lenses, laminae, and thin strata of loamy fine sand, sandy loam, very fine sandy loam, silt loam, silty clay loam, or silty clay are present which may have gray or dark gray colors within 40 inches of the soil surface

2C horizon:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 or 3

Texture: stratified very gravelly coarse sand to sand

Rock fragments: total range is 5 to 60 percent averaging 15 to 35 percent;

5 to 45 percent pebbles,

0 to 10 percent cobbles,

0 to 5 percent stones

Salinity, mmhos/cm: 2 to 4

Sodicity, SAR: 0 to 5

Redoximorphic features: few, fine to medium, faint or distinct, dark yellowish brown or strong brown redox concentrations

Washpass Series

Classification: Coarse-loamy, mixed Argic Cryoborolls

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately rapid

Landform: North-facing footslopes and backslopes of hills, buttes, and escarpments

Parent material: Colluvium derived from basalt and tuff-breccia

Slope range: 25 to 70 percent

Elevation: 8,200 to 9,800 feet

Mean annual precipitation: 20 to 24 inches

Mean annual air temperature: 39 to 41 degrees F.

Frost-free period: 60 to 90 days

Typical Pedon

Washpass fine sandy loam, stony, in an area of map unit 712—Sonsela-Washpass-Viewpoint complex, 20 to 70 percent slopes; San Juan County, New Mexico; about 9 miles west-southwest of Sheep Springs; 1,450 feet south and 700 feet east of the northwest corner of sec. 34, T.22N., R.19W.; latitude 36 degrees 6 minutes 1 second N and longitude 108 degrees 51 minutes 36 seconds W.

Soil surface is covered by 2 inches of aspen leaves, fir needles, and twigs; abrupt smooth boundary.

A—0 to 6 inches; dark brown (7.5YR 4/2) fine sandy loam, dark brown (7.5YR 3/2) moist; moderate medium granular structure; soft, very friable, slightly sticky and nonplastic; few coarse, common medium, few fine, and common very fine roots; common very fine irregularly shaped pores; 5 percent pebbles and less than 1 percent stones; moderately acid; clear smooth boundary.

BA—6 to 12 inches; brown (7.5YR 5/2) fine sandy loam, dark brown (7.5YR 3/2) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few coarse and medium and common fine and very fine roots; few fine and common very fine tubular pores; 5 percent pebbles; moderately acid; gradual smooth boundary.

Bt/E1—12 to 26 inches; brown (7.5YR 4/4) with pinkish gray (7.5YR 6/2) fine sandy loam, dark brown (7.5YR 3/4) with brown (7.5YR 4/3) moist; moderate coarse subangular structure; slightly hard, friable, slightly sticky and nonplastic; few coarse to fine and common very fine roots; common fine and very fine tubular pores;

common bleached sand and silt grains (skeletons) on faces of peds; few thin clay films on faces of peds and in pores; 10 percent pebbles; slightly acid; clear wavy boundary.

Bt/E2—26 to 36 inches; brown (7.5YR 4/4) with light brown (7.5YR 6/4) gravelly fine sandy loam, dark brown (7.5YR 3/4) with brown (7.5YR 4/4) moist; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few coarse to fine, and common very fine roots; common fine and very fine tubular pores; common bleached sand and silt grains (skeletons) on faces of peds; common thin clay films on faces of peds and in pores; 15 percent pebbles and 5 percent cobbles; slightly acid; clear wavy boundary.

Bt1—36 to 57 inches; brown (7.5YR 5/4) very gravelly fine sandy loam, dark brown (7.5YR 3/4) moist; moderate medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few fine and few very fine roots; few fine and common very fine tubular pores; few moderately thick clay films on faces of peds and common thin clay films on faces of peds and on rock fragments; 30 percent pebbles, 10 percent cobbles, and 5 percent stones; slightly acid; clear wavy boundary.

Bt2—57 to 73 inches; brown (7.5YR 5/4) very fine sandy loam, brown (7.5YR 4/4) moist; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few fine and few very fine roots; common fine and few very fine tubular pores; few moderately thick clay films on faces of peds and few thin clay films on faces of peds and on rock fragments; 5 percent pebbles; slightly acid; clear wavy boundary.

Bt3—73 to 85 inches; brown (7.5YR 5/4) gravelly fine sandy loam, weak medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; few fine and few very fine roots; few fine and few very fine tubular pores; few thin clay films on faces of peds and on rock fragments; 20 percent pebbles; slightly acid.

Range in Characteristics

Silicate clay content, control section weighted average: 10 to 18 percent

Rock fragments, control section weighted average: 10 to 35 percent

Depth to base of argillic horizon: 60 inches or more

Reaction: ranges from moderately acid in the surface to neutral in the subsoil

A horizon:

Value: 3 or 4 dry, 2 or 3 moist

Chroma: 2 or 3

Rock fragments: total range is 0 to 15 percent; 0 to 10 percent pebbles, 0 to 5 percent cobbles, 1 to 3 percent stones

BA horizon:

Value: 3 through 5 dry, 2 or 3 moist

Chroma: 2 or 3

Rock fragments: total range is 0 to 15 percent; 0 to 10 percent pebbles, 0 to 5 percent cobbles, 0 to 3 percent stones

Bt/E horizons:

Hue: 7.5YR or 10YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 2 through 4

Texture: fine sandy loam, gravelly fine sandy loam, or gravelly sandy loam

Rock fragments: total range is 10 to 35 percent; 10 to 20 percent pebbles, 0 to 10 percent cobbles, 0 to 5 percent stones

Bt1 horizon:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 3 through 5 moist

Chroma: 2 through 4

Texture: very gravelly fine sandy loam or very gravelly sandy loam

Rock fragments: total range is 35 to 60 percent; 30 to 40 percent pebbles, 5 to 15 percent cobbles, 0 to 5 percent stones

Bt2 and Bt3 horizons:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 through 4

Texture: gravelly fine sandy loam, gravelly sandy loam, or very fine sandy loam

Rock fragments: total range is 5 to 30 percent; 5 to 20 percent pebbles, 0 to 5 percent cobbles, 0 to 5 percent stones

Werito Series

Classification: Fine, mixed, mesic Typic Camborthids

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Slow

Landform: Toeslopes

Parent material: Alluvium and residuum derived from shale and sandstone

Slope range: 1 to 3 percent

Elevation: 5,400 to 6,000 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Werito loam, in an area of map unit 100—Werito loam, 1 to 3 percent slopes; San Juan County, New Mexico; about 5 miles northeast of Sheep Springs; 2,425 feet west and 3,275 feet south of the northeast corner of sec. 2, T.22N., R.17W.; latitude 36 degrees 10 minutes 3 seconds N and longitude 108 degrees 37 minutes 14 seconds W.

A—0 to 3 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; moderate thick platy parting to moderate very fine granular structure; soft, very friable, slightly sticky and slightly plastic; few fine and very fine roots; 5 percent fine pebbles and 5 percent small channers; strongly effervescent; moderately alkaline; clear smooth boundary.

Bwn1—3 to 7 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; weak coarse and moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; few medium and fine and common very fine roots; few very fine tubular pores; 5 percent pebbles; strongly effervescent; strongly alkaline; clear smooth boundary.

Bwn2—7 to 14 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; weak coarse and medium subangular blocky structure; slightly hard, friable, sticky and plastic; common fine roots; few fine tubular pores; 5 percent channers; strongly effervescent, secondary calcium carbonate segregated as very few fine irregularly shaped accumulations on faces of peds; strongly alkaline; clear smooth boundary.

Bkn—14 to 17 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; moderate coarse subangular blocky structure; slightly hard, friable, sticky and plastic; few medium and common fine and very fine roots; few very fine tubular pores; 10 percent soft shale fragments; 5 percent channers; strongly effervescent, secondary calcium carbonates segregated in few, fine and medium, irregularly shaped soft masses and filaments; moderately alkaline; clear smooth boundary.

2By—17 to 22 inches; grayish brown (10YR 5/2) silty

clay, very dark grayish brown (10YR 3/2) moist; moderate coarse subangular blocky structure; slightly hard, friable, sticky and plastic; few fine and common very fine roots; 20 percent soft shale fragments; 5 percent channers and 5 percent pebbles; secondary silt-sized gypsum crystals segregated in common, fine and medium, irregularly shaped seams and on rock fragments; mildly alkaline; clear wavy boundary.

2C—22 to 34 inches; brown (7.5YR 5/2) silty clay, dark brown (7.5YR 5/2) moist; massive, platy rock structure; hard, firm, sticky and plastic; few fine and very fine roots; 80 percent soft shale fragments; extremely acid; clear irregular boundary.

2Cr—34 inches; shale bedrock.

Range in Characteristics

Soil depth: 20 to 40 inches

Silicate clay content, control section weighted average: 35 to 55 percent

Depth to base of cambic horizon: 10 to 20 inches

Reaction: ranges from strongly alkaline in the subsoil to extremely acid in the lower substratum

A horizon:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

Bwn and Bkn horizons:

Value: 4 through 6 dry, 3 through 5 moist

Chroma: 1 through 4

Rock fragments: total range is 5 to 15 percent; 5 to 10 percent pebbles,

0 to 5 percent small channers

Salinity, mmhos/cm: 0 to 4

Sodicity, SAR: 5 to 30

Calcium carbonate equivalent: 3 to 10 percent

Other features: 0 to 15 percent soft shale fragments

By horizon:

Value: 3 through 6 dry, 2 through 5 moist

Chroma: 1 through 3

Texture: silty clay or silty clay loam

Salinity, mmhos/cm: 4 to 8

Sodicity, SAR: 13 to 30

Calcium carbonate equivalent: 1 to 3 percent

Gypsum content: 5 to 10 percent

Other features: 15 to 35 percent soft shale fragments

C horizon:

Hue: 7.5YR or 10YR

Value: 3 through 5 dry, 2 through 4 moist

Chroma: 1 through 4

Texture: silty clay or silty clay loam

Salinity, mmhos/cm: 4 to 8
Sodicity, SAR: 13 to 30
Calcium carbonate equivalent: 0 to 1 percent
Gypsum content: 0 to 1 percent
Other features: 50 to 95 percent soft shale fragments

Werjo Series

Classification: Fine-loamy, mixed (calcareous), mesic
 Aquic Torrifluvents
Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderately slow
Landform: High flood plains
Parent material: Alluvium derived from sandstone and shale
Slope range: 0 to 1 percent
Elevation: 4,700 to 5,000 feet
Mean annual precipitation: 5 to 8 inches
Mean annual air temperature: 51 to 54 degrees F.
Frost-free period: 140 to 160 days

Typical Pedon

Werjo loam, saline, in an area of map unit 157—
 Werjo, saline-Werjo loams, 0 to 1 percent slopes; San Juan County, New Mexico; within the town of Shiprock; 2,600 feet south and 1,000 feet west of the northeast corner of sec. 25, T.30N., R.18W.; latitude 36 degrees 47 minutes 6 seconds N and longitude 108 degrees 41 minutes 8 seconds W.

A—0 to 4 inches; grayish brown (10YR 5/2) loam, dark brown (10YR 3/3) moist; moderate medium granular structure; soft, very friable, slightly sticky and slightly plastic; few fine, and common medium and very fine roots; gypsum or sodium sulfate salts segregated as very few fine irregularly shaped accumulations as filaments; strongly effervescent; strongly alkaline; clear wavy boundary.

AC—4 to 12 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; few fine faint dark yellowish brown (10YR 4/4) redox concentrations; weak medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; few medium and fine and common very fine roots; gypsum or sodium sulfate salts segregated as few fine irregularly shaped accumulations as filaments; strongly effervescent; strongly alkaline; clear wavy boundary.

C1—12 to 17 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; few fine faint dark

yellowish brown (10YR 4/4) redox concentrations; massive; hard, firm, sticky and plastic; few medium and fine and common very fine roots; few thin strata of sandy loam and silty clay loam; gypsum or sodium sulfate salts segregated as few fine irregularly shaped accumulations as filaments; strongly effervescent; strongly alkaline; abrupt wavy boundary.

C2—17 to 24 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; few fine faint dark yellowish brown (10YR 4/4) and few fine distinct dark yellowish brown (10YR 4/6) redox concentrations; massive; hard, firm, sticky and slightly plastic; few fine and common very fine roots; few thin strata of very fine sandy loam and laminae of silt loam; gypsum or sodium sulfate salts segregated as very few fine irregularly shaped accumulations as filaments; strongly effervescent; strongly alkaline; clear wavy boundary.

C3—24 to 32 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; common medium distinct dark yellowish brown (10YR 4/6) redox concentrations, and few fine faint dark grayish brown (10YR 4/2) redox depletions; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; few thin strata of very fine sandy loam and silty clay loam; gypsum or sodium sulfate salts segregated as very few fine irregularly shaped accumulations as filaments; strongly effervescent; strongly alkaline; clear smooth boundary.

C4—32 to 44 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; common fine distinct dark yellowish brown (10YR 4/6) redox concentrations, and few fine faint dark grayish brown (10YR 4/2) redox depletions; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; few thin strata of fine sandy loam; gypsum or sodium sulfate salts segregated as very few fine irregularly shaped accumulations as filaments; slightly effervescent; strongly alkaline; clear wavy boundary.

C5—44 to 66 inches; light brownish gray (10YR 6/2) and pale brown (10YR 6/3) fine sandy loam, grayish brown (10YR 5/2) and brown (10YR 5/3) moist; common fine distinct dark yellowish brown (10YR 4/6) redox concentrations, and few fine faint to distinct gray (10YR 5/1) redox depletions; massive; soft, very friable, slightly sticky and

nonplastic; few fine and common very fine roots; few thin strata of loamy fine sand and few laminae of silt loam; gypsum or sodium sulfate salts segregated as very few fine irregularly shaped accumulations as filaments; slightly effervescent; moderately alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 18 to 35 percent

Reaction: ranges from moderately alkaline to strongly alkaline

Depth to redox concentrations: 4 to 12 inches

Depth to redox depletions: 23 to 40 inches

Depth to seasonal high water table: 3.5 to 5.0 feet

A or Ap horizon:

Value: 5 or 6 dry, 3 through 5 moist

Chroma: 2 or 3

Salinity, mmhos/cm: 2 to 8

Sodicity, SAR: 0 to 13

AC horizon:

Value: 5 or 6 dry, 3 through 5 moist

Chroma: 2 or 3

Texture: fine sandy loam or sandy clay loam

Salinity, mmhos/cm: 2 to 25

Sodicity, SAR: 0 to 30

Gypsum content: 0 to 1 percent

Redoximorphic features: few to common, fine, faint, dark yellowish brown redox concentrations

C horizons:

Value: 5 or 6 dry, 3 through 5 moist

Chroma: 2 or 3

Texture: stratified fine sandy loam to silty clay loam

Salinity, mmhos/cm: 2 to 25

Sodicity, SAR: 5 to 30

Gypsum content: 0 to 1 percent

Redoximorphic features: few to many, fine to medium, distinct or prominent, strong brown or dark yellowish brown redox concentrations, and grayish brown, gray, dark gray, or very dark gray redox depletions between 23 and 70 inches

Other features: lenses, laminae, and thin strata of sandy loam, fine sandy loam, very fine sandy loam, silt loam, silty clay loam, or silty clay are present

Werlog Series

Classification: Fine-loamy, mixed (calcareous), mesic Aquic Ustifluvents

Depth class: Very deep

Drainage class: Somewhat poorly drained

Permeability: Moderately slow

Landform: High flood plains

Parent material: Alluvium derived from sandstone and shale

Slope range: 0 to 1 percent

Elevation: 4,600 to 5,000 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Werlog silty clay loam, in an area of map unit 163—Werlog silty clay loam, 0 to 1 percent slopes; San Juan County, New Mexico; within the town of Shiprock; 900 feet south and 2,000 feet west of the northeast corner of sec. 31, T.30N., R.17W.; latitude 36 degrees 46 minutes 31 seconds N and longitude 108 degrees 40 minutes 15 seconds W.

A—0 to 2 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; few fine distinct dark yellowish brown (10YR 4/6) redox concentrations; weak very thick platy structure parting to moderate medium subangular blocky; hard, firm, sticky and plastic; few fine and few very fine roots; gypsum or sodium sulfate salts segregated as very few fine irregularly shaped accumulations as filaments; strongly effervescent; moderately alkaline; clear smooth boundary.

ACz—2 to 12 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; common fine distinct dark yellowish brown (10YR 4/6) redox concentrations, and few fine faint dark gray (10YR 4/1) redox depletions; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine and few very fine roots; few laminae of silty clay loam; sodium sulfate salts segregated as few fine irregularly shaped accumulations as filaments and soft masses; strongly effervescent; moderately alkaline; clear wavy boundary.

C1—12 to 21 inches; brown (10YR 5/3) with grayish brown (10YR 5/2) silty clay loam, dark brown (10YR 4/3) with dark grayish brown (10YR 4/2) moist; common fine prominent strong brown (7.5YR 4/6) and yellowish brown (10YR 5/6) redox concentrations, and few fine distinct dark gray (10YR 4/1) redox depletions; massive; hard, firm, sticky and plastic; few fine and common very fine roots; few lenses of fine sandy loam; gypsum or sodium sulfate salts segregated as very few fine irregularly shaped accumulations

as filaments and soft masses; slightly effervescent; moderately alkaline; clear wavy boundary.

C2—21 to 37 inches; pale brown (10YR 6/3) with light brownish gray (10YR 6/2) fine sandy loam, dark brown (10YR 4/3) with dark grayish brown (10YR 4/2) moist; common fine and medium prominent strong brown (7.5YR 4/6) and dark yellowish brown (10YR 4/6) redox concentrations, and few fine distinct dark gray (10YR 4/1) redox depletions; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine and common very fine roots; few lenses of loamy sand and silt loam; gypsum or sodium sulfate salts segregated as very few fine irregularly shaped accumulations as filaments; slightly effervescent; moderately alkaline; abrupt smooth boundary.

Cg1—37 to 48 inches; light gray (10YR 6/1) with gray (10YR 5/1) silty clay, dark gray (10YR 4/1) with very dark gray (10YR 3/1) moist; few fine prominent strong brown (7.5YR 4/6) and dark yellowish brown (10YR 4/6) redox concentrations; massive; very hard, very firm, sticky and plastic; few fine and very fine roots; few laminae of silty clay loam and few lenses of very fine sandy loam; slightly effervescent; moderately alkaline; clear smooth boundary.

Cg2—48 to 54 inches; gray (10YR 5/1) silty clay loam, dark gray (10YR 4/1) moist; few fine prominent dark yellowish brown (10YR 4/6) redox concentrations; massive; hard, firm, sticky and plastic; few fine and very fine roots; few thin strata of silt loam; slightly effervescent; moderately alkaline; clear smooth boundary.

Cg3—54 to 65 inches; gray (10YR 5/1) with light brownish gray (10YR 6/2) loam, dark gray (10YR 4/1) with dark grayish brown (10YR 4/2) moist; few fine prominent strong brown (7.5YR 4/6) redox concentrations; massive; hard, firm, slightly sticky and slightly plastic; few fine and very fine roots; few thin strata of loamy fine sand and silt loam; slightly effervescent; moderately alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 18 to 35 percent

Depth to redox concentrations: 0 to 4 inches

Depth to redox depletions: 2 to 20 inches

Depth to seasonal high water table: 2.0 to 3.5 feet

A horizon:

Value: 5 or 6 dry, 3 through 5 moist

Chroma: 2 or 3

Salinity, mmhos/cm: 16 to 50

Sodicity, SAR: 13 to 30

Gypsum content: 0 to 1 percent

ACz horizon:

Value: 5 or 6 dry, 3 or 4 moist

Chroma: 2 or 3

Texture: silt loam or loam

Salinity, mmhos/cm: 8 to 16

Sodicity, SAR: 13 to 30

Gypsum content: 0 to 1 percent

Redoximorphic features: few to common, fine to medium, faint to distinct, dark yellowish brown redox concentrations; few, fine, faint to distinct, grayish brown, gray, dark gray, or very dark gray redox depletions

C and Cg horizons:

Value: 5 or 6 dry, 3 or 4 moist

Chroma: 1 through 3

Texture: stratified fine sandy loam to silty clay

Salinity, mmhos/cm: 4 to 8

Sodicity, SAR: 5 to 13

Gypsum content: 0 to 1 percent

Redoximorphic features: few to many, fine to medium, distinct or prominent, strong brown or dark yellowish brown redox concentrations; few fine faint grayish brown, gray, dark gray, or very dark gray redox depletions; strong gleying is present in lower horizons with a dominant matrix chroma of 1

Other features: lenses, laminae, and thin strata of sandy loam, fine sandy loam, very fine sandy loam, silt loam, silty clay loam, or silty clay are present

Wetherill Series

Classification: Fine-silty, mixed, mesic Aridic Haplustalfs

Depth class: Deep and very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Eolian-mantled summits of mesas, plateaus, dipslopes of cuestras, and treads of fan terraces

Parent material: Eolian material derived from siltstone and sandstone

Slope range: 1 to 60 percent

Elevation: 6,200 to 8,500 feet

Mean annual precipitation: 12 to 16 inches

Mean annual air temperature: 48 to 50 degrees F.

Frost-free period: 120 to 150 days

Typical Pedon

Wetherill very fine sandy loam, in an area of map unit 400—Wetherill-Atlatl association, 1 to 15 percent slopes; San Juan County, New Mexico; about 16 miles northeast of Shiprock and 0.5 mile south of the Colorado-New Mexico state line; 1,850 feet west and 1,100 feet south of the northeast corner of sec. 17, T.32N., R.16W.; latitude 36 degrees 59 minutes 31 seconds N and longitude 108 degrees 32 minutes 41 seconds W.

A—0 to 3 inches, brown (7.5YR 5/4) very fine sandy loam, dark brown (7.5YR 3/4) moist; moderate very thick platy structure parting to weak fine granular; soft, very friable, slightly sticky and nonplastic; few fine and very fine roots; few very fine vesicular pores; weakly developed black cryptogam crust on soil surface; neutral; clear smooth boundary.

Bt—3 to 18 inches; reddish brown (5YR 5/4) loam, reddish brown (5YR 4/4) moist; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few medium and common fine and very fine roots; few fine and common very fine continuous tubular pores; common thin clay films on faces of peds and lining pores; mildly alkaline; clear smooth boundary.

Btk1—18 to 35 inches; light reddish brown (5YR 6/4) clay loam, reddish brown (5YR 4/4) moist; moderate coarse angular blocky structure; hard, firm, sticky and plastic; few coarse and fine and common medium and very fine roots; few very fine discontinuous tubular pores; few thin clay films on faces of peds and lining pores; strongly effervescent, secondary calcium carbonates segregated as few fine irregularly shaped accumulations on faces of peds and in pores; moderately alkaline; clear smooth boundary.

Btk2—35 to 42 inches; strong brown (7.5YR 5/6) loam, strong brown (7.5YR 4/6) moist; moderate coarse subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few medium and fine and common very fine roots; few very fine discontinuous tubular pores; few coarse tubular cicada larvae burrows; few thin clay films on faces of peds and bridging sand grains; strongly effervescent, secondary calcium carbonates segregated as few medium irregularly

shaped accumulations on faces of peds and in soft masses; moderately alkaline; clear wavy boundary.

Btk3—42 to 51 inches; light brown (7.5YR 6/4) loam, brown (7.5YR 5/4) moist; moderate coarse subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few medium and very fine roots; common very fine discontinuous tubular pores; very few thin clay films bridging sand grains; violently effervescent, secondary calcium carbonates segregated as common fine and medium irregularly shaped accumulations on faces of peds and in soft masses; moderately alkaline; clear wavy boundary.

Btk4—51 to 70 inches; strong brown (7.5YR 5/6) loam, strong brown (7.5YR 4/6) moist; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few medium and fine roots; common very fine discontinuous tubular pores; few thin clay films bridging sand grains; strongly effervescent, secondary calcium carbonates segregated as few fine irregularly shaped accumulations on faces of peds; moderately alkaline.

Range in Characteristics

Soil depth: 40 to 60 inches or more

Silicate clay content, control section weighted average: 18 to 30 percent

Depth to base of argillic horizon: 40 to more than 60 inches

Depth to secondary calcium carbonates: 3 to 25 inches

Depth to calcic horizon: occurs in some pedons at 40 to more than 60 inches

Reaction: ranges from neutral in the surface to strongly alkaline in the lower subsoil and substratum

A horizon:

Hue: 5YR or 7.5YR

Value: 3 or 4 moist

Chroma: 3 through 6

Bt horizon:

Value: 3 or 4 moist

Chroma: 4 through 6

Texture: loam, clay loam, or sandy clay loam

Very fine sand content: 35 to 50 percent

Upper Btk horizons:

Hue: 5YR or 7.5YR

Value: 5 or 6 dry

Chroma: 4 through 6

Texture: loam, clay loam, or sandy clay loam

Very fine sand content: 35 to 60 percent

Calcium carbonate equivalent: 1 to 10 percent

Other features: pedons of a steep phase have texture of very fine sandy loam

Lower Btk or Btb horizons:

Hue: 5YR or 7.5YR

Value: 5 through 8 dry, 4 through 7 moist

Chroma: 2 through 6

Texture: loam, sandy clay loam, or very fine sandy loam

Salinity, mmhos/cm: 0 to 2

Sodicity, SAR: 0 to 5

Calcium carbonate equivalent: 0 to 30 percent

Other features: pedons of a steep phase have texture of fine sandy loam below a depth of 40 inches; pedons of a deep phase have textures of cobbly sandy clay loam or cobbly clay loam below a depth of 40 inches

Whit Series

Classification: Fine-silty, mixed, mesic Typic Haplargids

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Eolian-mantled fan terraces and summits of mesas

Parent material: Eolian material derived from siltstone and sandstone

Slope range: 1 to 3 percent

Elevation: 5,500 to 6,100 feet

Mean annual precipitation: 6 to 8 inches

Mean annual air temperature: 52 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Whit very fine sandy loam, in an area of map unit 500—Whit very fine sandy loam, 1 to 3 percent slopes; San Juan County, New Mexico; about 14 miles south of Beclabito; 1,650 feet south and 2,000 feet east of the northwest corner of sec. 30, T.28N., R.20W.; latitude 36 degrees 38 minutes 7 seconds N and longitude 109 degrees 0 minutes 46 seconds W.

A—0 to 3 inches; yellowish red (5YR 5/6) very fine sandy loam, yellowish red (5YR 4/6) moist; moderate thick platy structure parting to weak medium granular; soft, very friable, slightly sticky and nonplastic; few fine and common very fine roots; common very fine irregularly shaped pores; mildly alkaline; abrupt smooth boundary.

BA—3 to 10 inches; yellowish red (5YR 5/6) very fine sandy loam, yellowish red (5YR 4/6) moist; moderate coarse subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; few medium and common fine and very fine roots; few fine and very fine tubular pores; slightly effervescent; mildly alkaline; clear smooth boundary.

Bt—10 to 19 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; strong coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine and common very fine roots; few fine and common very fine tubular pores; common thin clay films on faces of peds and lining pores; strongly effervescent, secondary calcium carbonates segregated as very few fine irregularly shaped accumulations on faces of peds; moderately alkaline; clear wavy boundary.

Btk—19 to 38 inches; light reddish brown (5YR 6/4) loam, yellowish red (5YR 4/6) moist; strong medium angular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine and common very fine roots; few fine and common very fine tubular pores; few thin clay films on faces of peds and lining pores; strongly effervescent, secondary calcium carbonates segregated as common medium irregularly shaped accumulations on faces of peds and as soft masses; moderately alkaline; clear wavy boundary.

Bk—38 to 57 inches; pink (5YR 7/3) loam, light reddish brown (5YR 6/4) moist; moderate medium platy structure; hard, friable, slightly sticky and slightly plastic; few fine and common very fine roots; few fine and very fine tubular pores; violently effervescent, matrix is impregnated with secondary calcium carbonates; moderately alkaline; clear irregular boundary.

2BCK—57 to 65 inches; reddish yellow (5YR 6/6) fine sandy loam, yellowish red (5YR 5/6) moist; weak coarse subangular blocky structure; hard, very friable, slightly sticky and nonplastic; few very fine roots; few fine and very fine tubular pores; strongly effervescent, secondary calcium carbonates segregated as few fine irregularly shaped accumulations on faces of peds; moderately alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 18 to 25 percent

Depth to base of argillic horizon: 20 to 40 inches

Depth to calcic horizon: 30 to 40 inches

Reaction: ranges from mildly alkaline in the surface to moderately alkaline in the subsoil and substratum

A and BA horizons:

Chroma: 4 or 6

Bt and Btk horizons:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 4 or 6

Texture: very fine sandy loam, loam, or sandy clay loam

Very fine sand content: 35 to 60 percent

Calcium carbonate equivalent: 5 to 10 percent

Bk and 2BCK horizons:

Value: 6 or 7 dry, 5 or 6 moist

Chroma: 4 or 6

Texture: very fine sandy loam or loam

Very fine sand content: 25 to 50 percent

Calcium carbonate equivalent: 15 to 50 percent

Other features: texture of fine sandy loam occurs below 40 inches

Wingrock Series

Classification: Coarse-loamy, mixed, mesic Typic Camborthids

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately rapid

Landform: Fan terraces below volcanic necks

Parent material: Alluvium derived from tuff-breccia and sandstone

Slope range: 4 to 15 percent

Elevation: 5,200 to 6,000 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 51 to 54 degrees F.

Frost-free period: 140 to 160 days

Typical Pedon

Wingrock gravelly loamy sand, in an area of map unit 235—Wingrock-Rock outcrop association, 4 to 15 percent slopes; San Juan County, New Mexico; about 9 miles southwest of Shiprock and 0.25 mile east of the Ship Rock pinnacle; 1,000 feet south and 300 feet west of the northeast corner of sec. 34, T.29N., R.19W.; latitude 36 degrees 41 minutes 16 seconds N and 108 degrees 49 minutes 39 seconds W.

A—0 to 5 inches; brown (10YR 5/3) gravelly loamy sand, brown (10YR 4/3) moist; weak medium platy structure parting to weak fine granular; soft, very friable, nonsticky and nonplastic; few very

fine roots; few very fine irregularly shaped pores; 20 percent pebbles; strongly effervescent; moderately alkaline; clear smooth boundary.

Bw—5 to 12 inches; brown (10YR 5/3) sandy loam, brown (10YR 4/3) moist; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common fine and very fine roots; common very fine irregularly shaped pores; 10 percent pebbles; strongly effervescent; strongly alkaline; clear wavy boundary.

Bk1—12 to 26 inches; brown (10YR 5/3) coarse sandy loam, brown (10YR 4/3) moist; moderate coarse subangular blocky structure; soft, very friable, slightly sticky and nonplastic; common fine and very fine roots; common very fine irregularly shaped pores; 10 percent pebbles; strongly effervescent, secondary calcium carbonates segregated as few fine irregularly shaped accumulations on faces of peds and rock fragments; strongly alkaline; clear wavy boundary.

Bk2—26 to 36 inches; pale brown (10YR 6/3) gravelly loamy coarse sand, brown (10YR 4/3) moist; weak coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; few fine and very fine roots; few fine irregularly shaped pores; 15 percent pebbles; strongly effervescent, secondary calcium carbonates segregated as few fine irregularly shaped accumulations on faces of peds and rock fragments; strongly alkaline; clear smooth boundary.

BCK1—36 to 53 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and common very fine roots; common very fine tubular pores; 5 percent pebbles; strongly effervescent, secondary calcium carbonates segregated as few fine irregularly shaped accumulations on rock fragments; strongly alkaline; gradual smooth boundary.

BCK2—53 to 70 inches; pale brown (10YR 6/3) sandy loam, yellowish brown (10YR 5/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few fine and very fine roots; common very fine tubular pores; 5 percent pebbles; strongly effervescent, secondary calcium carbonates segregated as few fine irregularly shaped accumulations on rock fragments; strongly alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 8 to 15 percent

Depth to base of cambic horizon: 12 to 26 inches

Reaction: ranges from moderately alkaline in the surface to strongly alkaline in the subsoil and substratum

A horizon:

Value: 5 or 6 dry

Rock fragments: 15 to 30 percent pebbles

Salinity, mmhos/cm: 0 to 2

Bw horizon:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

Texture: sandy loam or coarse sandy loam

Rock fragments: 5 to 15 percent pebbles

Salinity, mmhos/cm: 2 to 4

Sodicity, SAR: 0 to 5

Bk horizons:

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

Texture: stratified gravelly loamy coarse sand to sandy loam

Rock fragments: 10 to 25 percent pebbles

Salinity, mmhos/cm: 2 to 4

Sodicity, SAR: 0 to 5

BCK horizons:

Hue: 7.5YR or 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

Texture: sandy loam or fine sandy loam

Salinity, mmhos/cm: 4 to 8

Sodicity, SAR: 5 to 13

Xankey Series

Classification: Loamy-skeletal, mixed Mollic Eutroboralfs

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Backslopes of mesas and stable landslides

Parent material: Colluvium derived from sandstone and basalt

Slope range: 25 to 70 percent

Elevation: 7,500 to 8,500 feet

Mean annual precipitation: 16 to 20 inches

Mean annual air temperature: 42 to 45 degrees F.

Frost-free period: 90 to 120 days

Typical Pedon

Xankey very cobbly loam, extremely stony, in an area of map unit 610—Kunz-Xankey complex, 5 to 45 percent slopes; San Juan County, New Mexico; about 8.5 miles west-northwest of Sanostee; 875 feet west and 1,825 feet north of the southwest corner of sec. 24, T.26N., R.21W.; latitude 36 degrees 28 minutes 16 seconds N and longitude 109 degrees 1 minute 36 seconds W.

Soil surface is covered by 1 inch of pine needles, leaves, and twigs; abrupt smooth boundary.

A—0 to 6 inches; dark brown (7.5YR 3/2) very cobbly loam, black (7.5YR 2/1) moist; moderate thick platy structure parting to moderate medium granular; slightly hard, very friable, slightly sticky and nonplastic; common medium and fine and few very fine roots; common very fine irregularly shaped pores; 30 percent cobbles, 10 percent stones, 5 percent pebbles, and 2 percent boulders; neutral; abrupt smooth boundary.

Bt1—6 to 14 inches; brown (7.5YR 4/4) very cobbly sandy clay loam, dark brown (7.5YR 3/4) moist; moderate fine subangular blocky structure; hard, firm, sticky and slightly plastic; common medium and few coarse and very fine roots; few very fine irregularly shaped and common fine tubular pores; common thin clay films on faces of peds and lining pores; 30 percent cobbles, 15 percent stones, and 5 percent pebbles; neutral; clear smooth boundary.

Bt2—14 to 30 inches; brown (7.5YR 5/4) very stony sandy clay loam, brown (7.5YR 4/4) moist; moderate coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common coarse and medium, and few fine and very fine roots; common fine and very fine tubular pores; many thin clay films on faces of peds and lining pores; 25 percent stones, 20 percent cobbles, and 5 percent pebbles; neutral; gradual smooth boundary.

2BC—30 to 37 inches; light brown (7.5YR 6/4) sandy loam, brown (7.5YR 4/4) moist; weak coarse subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; common very fine and few medium and fine roots; common very fine and few fine tubular pores; 5 percent pebbles and 5 percent cobbles; neutral; clear smooth boundary.

2C1—37 to 44 inches; light gray (10YR 7/2) sandy

loam, gray (10YR 6/2) moist; massive; soft, very friable, slightly sticky and nonplastic; common very fine and few medium and fine roots; common very fine tubular pores; 5 percent pebbles and 5 percent cobbles; neutral; gradual smooth boundary.

2C2—44 to 63 inches; very pale brown (10YR 7/3) sandy loam, brown (10YR 5/3) moist; massive; soft, very friable, slightly sticky and nonplastic; common very fine and few fine roots; few very fine tubular pores; 5 percent pebbles and 5 percent cobbles; mildly alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 20 to 30 percent

Rock fragments, control section weighted average: 35 to 60 percent

Depth to base of argillic horizon: 24 to 40 inches

Depth to lithologic discontinuity of loamy material: 29 to 40 inches

Reaction: ranges from neutral in the surface and subsoil to mildly alkaline in the substratum

A horizon:

Hue: 5YR or 7.5YR

Value: 3 or 4 dry, 2 or 3 moist

Chroma: 2 or 3

Rock fragments: total range is 35 to 60 percent; 5 to 10 percent pebbles, 25 to 30 percent cobbles, 5 to 15 percent stones, 0 to 5 percent boulders

Bt horizons:

Hue: 5YR or 7.5YR

Value: 4 through 6 dry, 3 through 5 moist

Chroma: 3 through 6

Texture: very cobbly sandy clay loam or very stony sandy clay loam

Rock fragments: total range is 35 to 60 percent; 0 to 5 percent pebbles, 20 to 30 percent cobbles, 15 to 25 percent stones

2BC and 2C horizons:

Hue: 5YR through 10YR

Value: 5 through 7 dry, 4 through 6 moist

Chroma: 2 through 6

Texture: sandy loam or cobbly sandy loam

Rock fragments: total range is 10 to 25 percent; 5 to 15 percent pebbles, 5 to 10 percent cobbles

Yahmore Series

Classification: Coarse-loamy, mixed Pachic Argiborolls

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Toeslopes and footslopes of stable landslides

Parent material: Alluvium derived from sandstone, shale, and basalt

Slope range: 1 to 15 percent

Elevation: 7,400 to 8,600

Mean annual precipitation: 16 to 20 inches

Mean annual air temperature: 41 to 45 degrees F.

Frost-free period: 90 to 120 days

Typical Pedon

Yahmore fine sandy loam, in an area of map unit 600—Kunz-Yahmore complex, 2 to 35 percent slopes; San Juan County, New Mexico; about 7 miles west of Sheep Springs; 100 feet east and 100 feet south of the northwest corner of sec. 25, T.22N., R.19W.; latitude 36 degrees 7 minutes 7 seconds N and longitude 108 degrees 49 minutes 35 seconds W.

Soil surface is covered by 1 inch of pine needles, twigs, and cones; abrupt smooth boundary.

A—0 to 5 inches; brown (7.5YR 5/2) fine sandy loam, dark brown (7.5YR 3/2) moist; moderate thick platy structure parting to moderate medium granular; soft, very friable, slightly sticky and nonplastic; few fine and common very fine roots; few very fine irregularly shaped pores; neutral; clear smooth boundary.

BA—5 to 21 inches; brown (7.5YR 5/3) fine sandy loam, dark brown (7.5YR 3/3) moist; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few coarse and medium and common fine and very fine roots; few fine and common very fine tubular pores; neutral; clear wavy boundary.

Bt1—21 to 33 inches; brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; moderate coarse subangular blocky structure; hard, friable, slightly sticky and nonplastic; few coarse, medium, and fine and common very fine roots; few fine and common very fine tubular pores; few thin clay films on faces of peds and lining pores; neutral; clear wavy boundary.

Bt2—33 to 44 inches; reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, firm, slightly sticky and slightly plastic; few coarse and very fine roots; few fine and very fine tubular pores; common moderately thick clay films on faces of peds and lining pores; neutral; gradual smooth boundary.

Bt3—44 to 64 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; moderate medium prismatic structure parting to weak medium subangular blocky; hard, firm, slightly sticky and slightly plastic; few fine and very fine roots; few fine and very fine tubular pores; common moderately thick clay films on faces of peds and lining pores; neutral.

Range in Characteristics

Silicate clay content, control section weighted average: 10 to 18 percent

Depth to base of mollic epipedon: 16 to 29 inches

Depth to base of argillic horizon: 40 to 60 inches or more

Reaction: ranges from slightly acid in the surface to neutral in the subsoil

A horizon:

Hue: 7.5YR or 10YR

Value: 4 or 5 dry

Chroma: 1 or 2

Texture: fine sandy loam, sandy loam, or loam

BA horizon:

Value: 3 through 5 dry, 2 or 3 moist

Chroma: 1 through 3

Texture: fine sandy loam or sandy loam

Upper Bt horizons:

Value: 4 through 6 dry, 3 or 4 moist

Chroma: 2 through 4

Texture: fine sandy loam or sandy loam

Lower Bt horizons:

Hue: 5YR through 10YR

Value: 5 through 7 dry, 4 through 6 moist

Chroma: 3 through 6

Texture: sandy clay loam or sandy loam

Other features: some pedons have relict redox concentrations, soft shale fragments, or minor amounts of secondary calcium carbonates

Zibetod Series

Classification: Loamy-skeletal, mixed Lithic Argiborolls

Depth class: Shallow

Drainage class: Well drained

Permeability: Moderately rapid

Landform: Footslopes and shoulders of domes

Parent material: Residuum, alluvium, and eolian material derived from sandstone, siltstone, and quartz diorite

Slope range: 15 to 35 percent

Elevation: 8,500 to 9,400 feet

Mean annual precipitation: 18 to 20 inches

Mean annual air temperature: 42 to 45 degrees F.

Frost-free period: 80 to 100 days

Typical Pedon

Zibetod extremely cobbly very fine sandy loam, extremely stony, in an area of map unit 618—Zibetod-Bigpaw complex, 5 to 35 percent slopes; Apache County, Arizona; about 9.5 miles southwest of Teec Nos Pos; 1,575 feet north and 1,200 feet east of the southwest corner of sec. 7, T.39N., R.30E.; latitude 36 degrees 47 minutes 59 seconds N and longitude 109 degrees 10 minute 14 seconds W.

A—0 to 2 inches; dark brown (7.5YR 4/2) extremely cobbly very fine sandy loam, dark brown (7.5YR 3/2) moist; weak thick platy structure parting to moderate medium granular; soft, very friable, slightly sticky and nonplastic; few fine and common very fine roots; common very fine irregularly shaped pores; 35 percent cobbles, 15 percent pebbles, 10 percent channers, 5 percent flagstones, and 5 percent stones; neutral; clear smooth boundary.

Bt1—2 to 9 inches; dark brown (7.5YR 3/2) very cobbly very fine sandy loam, very dark brown (7.5YR 2/2) moist; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few medium and common fine and very fine roots; few very fine tubular pores; common thin clay films on faces of peds and lining pores; 20 percent cobbles, 10 percent pebbles, 5 percent stones, and 5 percent channers; slightly acid; clear wavy boundary.

Bt2—9 to 14 inches; brown (7.5YR 4/3) very cobbly fine sandy loam, dark brown (7.5YR 3/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few medium and fine and common very fine roots; few fine and very fine tubular pores; common thin clay films on faces of peds and on rock fragments; 25 percent cobbles, 10 percent pebbles, 10 percent stones, and 5 percent channers; slightly acid; abrupt wavy boundary.

R—14 inches; sandstone bedrock.

Range in Characteristics

Soil depth: 10 to 20 inches

Silicate clay content, control section weighted average: 14 to 18 percent

Rock fragments, control section weighted average: 35 to 80 percent

Depth to base of argillic horizon: 10 to 20 inches

Reaction: ranges from slightly acid to neutral

A horizon:

Value: 4 or 5 dry, 2 or 3 moist

Rock fragments: total range is 60 to 80 percent; 25 to 30 percent pebbles and channers (less than 3 inches long),

30 to 35 percent cobbles and flagstones (less than 10 inches long),

5 to 15 percent stones

Bt horizons:

Value: 3 through 5 dry, 2 through 4 moist

Chroma: 2 or 3

Texture: very cobbly very fine sandy loam or very cobbly fine sandy loam

Rock fragments: total range is 35 to 60 percent; 10 to 15 percent pebbles and channers (less than 3 inches long),

20 to 35 percent cobbles,

5 to 10 percent stones

Zilditloi Series

Classification: Mixed, frigid Typic Ustipsamments

Depth class: Very deep

Drainage class: Excessively drained

Permeability: Rapid

Landform: Backslopes of escarpments

Parent material: Colluvium and residuum derived from sandstone

Slope range: 60 to 90 percent

Elevation: 7,600 to 9,000 feet

Mean annual precipitation: 16 to 20 inches

Mean annual air temperature: 40 to 43 degrees F.

Frost-free period: 80 to 110 days

Typical Pedon

Zilditloi loamy sand, very stony, in an area of map unit 608—Narbona-Zilditloi complex, 45 to 90 percent slopes; Apache County, Arizona; about 14.5 miles south of Red Rock; 1,350 feet east and 2,050 feet north of the southwest corner of sec. 31, T.35N., R.31E.; latitude 36 degrees 23 minutes 44 seconds N and longitude 109 degrees 2 minutes 59 seconds W.

A—0 to 7 inches; brown (10YR 5/3) loamy sand, dark brown (10YR 4/3) moist; weak medium platy structure parting to weak medium granular; soft, very friable, nonsticky and nonplastic; common medium and many very fine roots; 5 percent channers, 5 percent flagstones, and 1 percent stones; mildly alkaline; clear wavy boundary.

2C1—7 to 31 inches; very pale brown (10YR 7/3) sand, pale brown (10YR 6/3) moist; massive; soft, very friable, nonsticky and nonplastic; few coarse and very fine roots; vertical to angled cracks 0.5 to 1.5 inches wide filled with pinkish gray (7.5YR 6/2) calcareous loamy sand; secondary calcium carbonates segregated on sand grains and root surfaces in the cracks; mildly alkaline; clear wavy boundary.

2C2—31 to 70 inches; very pale brown (10YR 7/3) sand, pale brown (10YR 6/3) moist; massive; hard, friable, nonsticky and nonplastic; few coarse and very fine roots concentrated in, but not restricted to cracks; 10 percent soft sandstone fragments; vertical to angled cracks 0.5 to 1.5 inches wide filled with pinkish gray (7.5YR 6/2) calcareous loamy sand; secondary calcium carbonates segregated on sand grains and root surfaces in the cracks; mildly alkaline.

Range in Characteristics

Silicate clay content, control section weighted average: 2 to 8 percent

Rock fragment content, control section weighted average: less than 5 percent

Reaction: ranges from neutral to mildly alkaline

A horizon:

Hue: 5YR through 10YR

Value: 3 or 4 moist

Chroma: 2 through 4

Rock fragments: total range is 0 to 15 percent; 0 to 5 percent channers, 0 to 5 percent flagstones, 0.5 to 3 percent stones

C horizons:

Hue: 5YR through 10YR

Value: 6 or 7 dry, 4 through 6 moist

Chroma: 2 through 6

Texture: sand, fine sand, or loamy fine sand

Calcium carbonate equivalent: 0 to 1 percent

Other features: 0 to 25 percent soft sandstone fragments

Formation of the Soils

This section defines soil, describes the factors of soil formation, and relates them to the formation of the soils in Shiprock Area.

Soil, as used in this publication, is a natural body or a collection of natural bodies on the earth's surface, containing living matter and supporting or capable of supporting plant life. Its upper limit is air or shallow water. At its margins it grades to deep water or to barren areas of rock. Soil grades at its lower limit to bedrock or to earthy materials virtually devoid of roots, animals, or marks of other biologic activity (USDA, 1975; USDA, 1992). Soil is a dynamic medium forming a living shell of varying thickness over the rocky crust of the Earth.

Soil is the result of the interaction of five soil forming factors (Birkeland, 1984; Jenny, 1941). These factors determine the unique properties and characteristics of a soil at any given location. The five soil forming factors are: (1) the type and mineralogical composition of the parent material; (2) the living organisms on and in the soil; (3) the topography or "lay of the land"; (4) the different climates that the soil has been exposed to; and (5) the length of time these development forces have acted upon the soil. The interrelationship of these factors is very complex, and it is difficult to isolate the effects of any one factor. The effect of the factors also varies from place to place, but the interaction of the factors ultimately determines the kind of soil that forms. The term "pedogenesis" (soil genesis) is often used to connote the process of soil formation.

Factors of Soil Formation

Parent Material

Parent material is the unconsolidated organic and mineral matter in which soil forms. Parent materials influence or wholly determine the color, texture, mineralogy, structure, consistency, reaction, erodibility, and natural fertility of soil.

Most mineral matter is ultimately derived from some type of rock. The Shiprock Area, being a part of the larger Colorado Plateau province, has landscapes that in some areas are dominated by

exposed bedrock. The vast majority of the bedrock types present here are sedimentary rocks. These stratified sedimentary rock layers are grouped together into mappable units called formations. Physical and chemical weathering of rocks in these exposed geologic formations, accompanied by natural erosion, provides an abundant source of loose rock debris for the parent materials of soils.

Since the parent materials derived from particular geologic formations have specific characteristics, the soils that form in them tend to have similar characteristics. For example, the upper member of the Mancos Shale yields parent materials that have high amounts of silt and very fine sand. The Littlehat and Tsebitai series are examples of soils which formed in these very silty parent materials. The silt content in these soils is high enough to influence their properties strongly and to enable them to be classified into the silty particle-size classes of Soil Taxonomy. Certain other properties, such as mineralogy and soil color, are strongly influenced by the initial nature of the parent materials. These predictable properties are especially evident in dry regions where the rate of chemical weathering of parent materials is generally slow because of the unavailability of abundant soil moisture.

Enough moisture is present in dry regions for physical weathering by salts to occur. Salt weathering is a process that operates upon rocks and parent materials high in sodium salts or calcium compounds. Soluble salts move through bedrock, parent materials, and soils in response to fluctuating moisture conditions. The presence of high amounts of salts transforming and recrystallizing tends to disrupt the natural fabric of bedrock and rock fragments as well as the matrix of soil horizons (Birkeland, 1984). This action disintegrates rocks and separates mineral particles, allowing thickening of soil parent materials to occur.

Many soils in the Shiprock Area occurring in the desert and semidesert regions have high amounts of soluble salts, exchangeable sodium, and gypsum. The dominant soluble salt mineral present in these regions is sodium sulfate (Na_2SO_4), which is generally inherited from sedimentary rocks. Different

soil series are affected to different degrees by salts and sodium and so have different properties. For example, a strongly saline-sodic soil such as the Chinde series has a faster permeability rate than the moderately saline-sodic Notal series. This difference is the result of the flocculating effect on clay particles of high amounts of soluble salts, causing granular structure to form in the Chinde soil. Natric horizons form when soluble salts are moved deeper into a soil profile and exchangeable sodium remains to be adsorbed onto soil colloids. High amounts of exchangeable sodium accompanied by low amounts of soluble salts causes a dispersive effect on clay particles, which allows them to move easily by the process of illuviation. Natric horizons in a typical sodic soil such as the Benally series have poor physical properties which impede plant growth. Many perennial species of saltbush (*Atriplex*) and associated plants are adapted to the varying levels of salinity and sodicity present in soil (Hodgkinson, 1987). Gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) is the most common sulfate mineral occurring in soils (Donner and Lynn, 1977). It is also a very common mineral of several soils in the area. The shallow Persayo and Toadlena series are soils which have relatively high amounts of gypsum that are partially inherited from the parent material.

The soils in the Shiprock Area formed in several types of parent material. Some soils have formed in only one type of material, while many others have formed in a combination of several of the different types. The parent materials present are alluvium, residuum, colluvium, and eolian material, along with minor amounts of lacustrine deposits. All of these types of materials are discussed in the following paragraphs.

Alluvium is sediment that has been moved by water. It may have been moved many miles or only a few feet. In this survey area, it commonly is derived from a bedrock such as shale, but it may also be derived from existing soils which are undergoing accelerated erosion.

Alluvial deposits are typically stratified because of the fluctuating nature of the processes involving erosion, transportation, and deposition of sediments. This inherent stratification is clearly evident in very young alluvial deposits, but is less evident in deposits where pedogenesis has altered or obscured it. Differences in particle or grain sizes because of stratification plays an important role in the diagnostic horizons which may form in a soil. For example, calcic horizons in soils typically form over or in layers which have distinct differences in grain size. This effect occurs because of the difference in the

size of the pores between different strata or layers, which affects water flow. These different layers slow the movement of soil water and allow compounds such as calcium carbonate held in suspension to be withdrawn into large soil pores where they accumulate over time. The Mesa series is an example of a soil having a calcic horizon that formed in this manner.

Most soils in the Shiprock Area forming in Holocene alluvium do not have diagnostic subsurface horizons and have properties which are a direct result of the parent material. The coarse textured Bebeevan soil, forming in sandy alluvium deposited by the San Juan River, has much different properties than the moderately fine textured Werjo soil. The Werjo soil is forming in finer textured alluvium derived from sandstone and shale. The Uzaneva soil is forming in Holocene alluvium, but has developed a thin natric horizon in a short time period because of the presence of exchangeable sodium.

Common landforms or landform positions in this survey area where alluvium is a dominant parent material are flood plains, alluvial fans, stream terraces, fan terraces, toeslopes, and footslopes. The sequence of high stream terraces along the valley of the San Juan River is a distinctive feature of the survey area in New Mexico (Shelton, 1966).

Residuum is material formed in place by the physical and chemical weathering of bedrock. The deep phase of the coarse textured Denazar series is an example of a soil which has formed mostly in residuum derived from sandstone. The Denazar soil has very different textural properties than the fine textured Werito soil, which formed mostly in residuum derived from shale. Clay mineralogy is strongly influenced by the residuum derived from certain shaly formations. An example is the residuum derived from the Brushy Basin Member of the Morrison Formation, which contains shale and claystone beds high in bentonite. Bentonitic rocks yield parent materials having a high content of expanding clay minerals. The fine textured Bodot and McElmo series have formed mostly in residuum derived from such types of bedrock and have high shrink-swell properties. By contrast, the fine textured Patel series lacks high shrink-swell properties because it has formed dominantly in residuum derived from shales which lack high amounts of expanding clays.

Common landform positions in this survey area where residuum is an important parent material are summits of mesas, plateaus, and structural benches; dipslopes of cuestas; and shoulders of domes.

Colluvium is material that has been moved down steep slopes by mass wasting processes. It is

largely material that has rolled, slid, or fallen down slope because of the influence of gravity. The size fractions of particles in most colluvial deposits are large, and the material is unsorted. The rock fragments in colluvium are usually angular, except where the fragments are derived from rock formations or unconsolidated deposits that have preexisting, rounded fragments. Narbona soils formed in colluvium derived from sandstone and have different properties than Sonsela soils, which formed in colluvium derived mostly from basalt.

Many soils in the Shiprock Area which occur on steep slopes have formed in a combination of colluvium over residual material. The Captom series is an example of a soil that formed in a stony colluvium derived from hard sandstone beds, which was deposited over residuum derived from a much softer underlying bedrock.

Colluvium is an important soil parent material on backslopes and stable landslides.

Eolian material is sediment that has been carried and deposited by wind. It commonly is sand and silt, but may also be aggregates of clay-size particles. Eolian materials may move many miles in the case of silt and very fine sand, or relatively short distances in the case of fine or medium sand. Calcium carbonate and other chemical compounds such as sodium sulfate are also moved and redeposited by wind in the form of dust (Gile, et al., 1981; Harden, et al., 1991; USDA, 1979). Such atmospheric additions of dry clay and fine silt-size particles has a significant cumulative effect over a long period of time, especially on stable landform positions. Labile calcium released by calcareous dust into the soil water may combine with the sulfate anion present in saline soils to form accumulations of secondary gypsum. The Brimhall and Nataani series are examples of soils with gypsic horizons which may have formed in this way.

Loess is the term for eolian material of dominantly silt-sized particles. The Four Corners region has extensive deposits of eolian materials, some of which have high amounts of very fine sand and silt. These loess deposits were derived from exposed red siltstone and sandstone beds occurring in deserts west of the Shiprock Area. In nearby southern Colorado, this eolian material is known as the Mesa Verde loess, and is a very important parent material for many soils series (Arrhenius and Bonatti, 1965; Price, et al., 1988). The moderately fine textured Wetherill and Blanding series are examples of soils which formed in this type of silty eolian deposit. The coarse textured Sheppard series and the moderately coarse textured Sogzie series are examples of soils

which formed in eolian material having a much higher content of fine sand.

The most common landform in this survey area where thick deposits of eolian material occur is stable dunes. However, many landform positions such as summits of mesas have mantles of eolian material which strongly influenced the soils that formed there.

Lacustrine deposits are materials that settled out of the still water of lakes and ponds. It is of minor extent in this survey area. The Retaw soil has formed in lacustrine deposits derived mainly from sandstone. The landform position in the Shiprock Area in which lacustrine material is commonly deposited are small rock basins in the Chuska and Lukachukai Mountains.

Living Organisms

Living organisms have a significant effect on the formation of soil. Plant, animal, and microbial life affect such processes as the physical and chemical weathering of bedrock and parent material, the rates of organic matter decomposition and biochemical transformation, and plant nutrient cycling, to name a few. Plants probably exert the greatest influence on soil formation. Plant roots grow into bedrock and parent material, breaking it loose into individual particles. Roots exert strong pressures to force open joints in rock and unconsolidated materials, making them more porous. Some plants cycle nutrients from great depths in the soil, making them available to other plants and animals. For example, black greasewood and mound saltbush shrubs growing on low stream terraces accumulate sodium brought up from very deep soil layers into their leaves. When these leaves become incorporated into the soil surface and decompose they increase the content of exchangeable sodium in the soil. The Shumbegay soil has thin Btn horizons as a result of this sodium cycling by black greasewood plants.

The type of existing plant cover affects the amount of evapotranspiration that occurs on soil. Akhoni soils, which occur under an overstory of ponderosa pine, have a much lower evapotranspiration rate than Farb soils, which occur under a sparse cover of desert grasses and shrubs.

Animals also have an impact on soil formation. Creatures such as ants, earthworms, cicada larvae, mice, moles, prairie dogs, and badgers live and burrow in the soil. Their activities mix layers and concentrate soil particles, increase porosity and permeability, and recycle plant matter and nutrients. Microorganisms such as certain soil bacteria

participate vigorously in the basic enzymic transformations of nitrification, sulphur oxidation, and nitrogen fixation (Brady, 1974). These are processes that are vital if a soil is to support higher plants. Actinomycetes are bacteria-like fungi which are of great importance in the decomposition of soil organic matter and are also partly responsible for the aroma of fresh soil. Certain species of fungi may aid or speed the accumulation of calcium carbonate within desert soils (Monger et al., 1991).

Field research by ecologists is revealing the growing importance that algae and spore producing plants play in the health and stability of fragile soils in dry regions. Cryptogamic soil crusts form on and directly under the soil surface when symbiotic communities of algae, fungi, mosses, and lichens flourish. These cryptogam crusts are characteristically dark and lumpy and can become well developed on sandy, saline, or gypsiferous soils in which gravel lags or desert pavements are not present. These firm crusts are important because they stabilize and protect otherwise sparsely vegetated soils from the hazards of water erosion and soil blowing (Anderson et al, 1982; Brotherson et al, 1983). Other benefits which cryptogam crusts provide is adding organic matter, fixing atmospheric nitrogen, increasing water infiltration, and increasing moisture content of the upper inch of soil (Dunne, 1989). Many soils in the Shiprock Area which once had healthy cryptogam crusts no longer support them because of excessive disturbance by grazing livestock. The Bluechief and Mido series are examples of soils which degrade and are subject to severe soil blowing when cryptogam crusts are completely destroyed. Well developed cryptogam crusts are still preserved on most areas of very shallow soils such as the Nizhoni series.

Humans alter the soil by building structures, manipulating rangeland plants for livestock, harvesting or chaining trees, and by leveling, tilling, planting, and irrigating for crop production. All of these activities can cause serious soil erosion if care is not taken by land users. Human actions may have a beneficial effect if stewardship of the soil resource is practiced.

Topography

Topography has an important influence on soil formation because of both the slope gradient and the aspect. Slope gradient determines the rate of surface runoff and the hazard of soil erosion by water. The Zilditloi soil has a rapid rate of surface runoff and a

severe hazard of water erosion because of steep slopes, resulting in only minimal soil development. By contrast, the Deza soil has a slow rate of surface runoff and a slight hazard of water erosion because it is on more gentle slopes and has developed an argillic horizon.

Topography also affects the internal drainage of soils. The very deep phase of the Klizhin soil occurs on 15 to 35 percent slopes, but becomes saturated during spring as the normally thick snowpack in the Chuska Mountains melts. It is well drained because the gravitational water is transmitted quickly through the substratum into areas of the adjacent Bikeyah soil. The Bikeyah soil is moderately coarse textured like the Klizhin soil, but occurs on slopes of 1 to 15 percent in open valleys and is somewhat poorly drained. This relationship is an example of a small soil catena.

Soils that have drainage classes ranging from moderately well drained to very poorly drained possess visible features which are indicative of periodic saturation, reduction, desaturation, and re-oxidation. Redoximorphic features (wetness mottles) form when iron and manganese compounds become soluble and migrate because excess soil moisture and the activity of certain soil microorganisms has resulted in a lack of oxygen. These intermingled spots of red, yellow, brown, gray, or black colors are known as redox concentrations if their chroma is more than 2, and redox depletions if 2 or less. Strong gleying occurs in some soil horizons that are grey colored and have reduced iron. Horizons with some or all of these features are very evident in soils such as Canburn, Green River, Owlspring, Retaw, and Werlog. The relief of a particular area has the effect of determining the drainage classes of soils. Slight differences in flood plain elevation result in varying depths to a seasonal high water table. These elevation differences are responsible for the different drainage classes of the adjacent Bebeever and Walrees soils.

The aspect, or direction a slope faces, can also affect soil formation. Steep north-facing slopes have cooler, more moderate temperatures and more effective soil moisture than steep south-facing slopes. In the Carrizo Mountains the Pastorpeak soil occurs on slopes with north-facing aspects and has a canopy of mostly Douglas-fir trees. In this cool environment, thick mollic epipedons have formed. By contrast, Ligai soils occurring on adjacent slopes with south-facing aspects have an overstory of mostly pinyon trees and much thinner mollic epipedons. Other series where aspect plays an

important role in soil formation are the Bangston, Tunitcha, Sonsela, and Washpass soils.

Topography affects the climatic factors of soils in areas of deeply entrenched canyons. The phenomenon of nighttime cold air drainage down into canyons effectively lengthens the frost-free period of soils on adjacent uplands, while shortening the period for the soils on the canyon floors (Erdman, et al., 1969).

Climate

Climate plays an important role in the formation of soils. Climate is a dynamic factor that fluctuates monthly and yearly in the mid-latitudes in response to the seasons. It has also undergone significant global changes over the long span of geologic time. A change in climate alters the balance of other soil forming factors, and soils often display morphologic features which formed under the influence of past climates. Many soils in dry regions which have argillic horizons overlying well developed calcic horizons probably display the effects of changing climates. The early Holocene epoch was a time of continent-wide climatic change. Additions of calcium carbonate due to increasingly arid conditions caused engulfment of argillic horizons by secondary carbonate accumulations. The Millett series is an example of a soil with a calcareous argillic horizon which provides evidence that clay accumulation occurred during a time of more effective precipitation.

Temperature and precipitation are the most important climate factors in this survey area. A wide range of soil temperature and moisture regimes is possible in soils because of differences in these climatic factors. Soil temperature regimes in the survey area range from mesic at low and middle elevations to cryic on distinct north aspects at the highest elevations.

Temperature affects the rate of biological activity, the rate of decomposition of organic matter, and the rate of certain chemical reactions. Some rates effectively double for every 10 degree C. rise in temperature (Brady, 1974). This effect is illustrated by comparing the moderately coarse textured Klizhin and Sogzie soils. Klizhin soils occurring under montane forest are cooler, have higher biomass production, and a lower rate of organic matter decomposition. Consequently, Klizhin soils have a higher content of organic matter than Sogzie soils occurring in the warmer climate of a desert grassland ecosystem.

Soil moisture regimes range from typic aridic in the desert areas receiving 5 to 8 inches average

annual precipitation, to typic ustic in the Chuska Mountains area, which receives as much as 24 inches of annual precipitation. Aquic conditions occur in soils that occupy low-lying landforms frequently saturated by surface or subsurface ground waters.

Regional and local weather patterns determine when, what types, and in what amounts precipitation will fall. The Shiprock Area has a distinct bi-seasonal pattern of precipitation with significant amounts of moisture coming in winter and summer. Table 1 displays typical monthly precipitation amounts for locations in the survey area. The entire Four Corners region displays the xeric conditions of cool, moist winters and warm, dry summers (USDA, 1975). Soils at the higher elevations receive much more winter precipitation than those at the lower elevations. Moisture coming in the winter in the form of snow and gentle rain eventually penetrates deeply into soil profiles and is very effective for leaching. Spring months are normally dry and windy with little rainfall. The strong spring winds intensify the dry climate and deplete soil moisture through high evaporation rates. Moisture coming in summer, when evapotranspiration rates are higher, penetrates to only very shallow depths. Summer moisture typically comes as heavy rainfall from high-intensity thunderstorms of short duration. These summer monsoon storms, occurring between July and September, are isolated in extent and undependable in occurrence. Much of the moisture that falls from such storms runs off the soil surfaces and is unavailable for plant growth.

Soil moisture affects the types of native vegetation present, the rate of biologic activity, the rate of leaching of chemical compounds, and the degree of illuviation of soil colloids. Within certain limits, increasing amounts of soil moisture will result in an increasing amount of leaching and illuviation. The Mack soil, with a mean annual precipitation of about 7 inches has limited soil moisture, a relatively thin, calcareous argillic horizon, and a well developed calcic horizon occurring within 30 inches of the soil surface. By contrast, the Kunz soil, with a mean annual precipitation of about 18 inches, has more soil moisture and a thick, well developed argillic horizon, and is completely leached of calcium carbonate.

Time

The length of time that parent materials have been exposed to the effects of climate and living organisms is an important factor in soil development. In general, the longer the time period that a soil has been forming, the stronger the degree of expression of its diagnostic horizons. Young alluvial soils such as

the Escavada and Outpost series have had very little time to develop and do not have any diagnostic surface or subsurface horizons. Soil age is the measure of this length of time and is determined by several methods.

The relative age of soils can be established from the chronological arrangement of geomorphic surfaces. An example of this method compares the development of subsurface horizons on high stream terraces above the San Juan River. The moderately coarse textured Nageezi series has calcic horizons which vary in degree of expression. Those areas of Nageezi soils on the highest, most stable terrace surfaces have thicker calcic horizons with a higher calcium carbonate equivalent than those on lower and younger terraces. The soils in the Shiprock Area are of Holocene and Pleistocene geologic times and vary in the soil morphological features which are indicative of these epochs.

The development of carbonate (Bk) horizons of pedogenic origin is closely related to soil age (Gile, et al., 1981; USDA, 1979). Soils with horizons of calcium carbonate accumulation are very common in the survey area. A sequence of four stages of carbonate accumulation allows estimates of development time to be made on soils having these genetic horizons.

The Aneth, Claysprings, Fruitland, Genats, Piute, Ravola, and Razito series are all young soils. A minimal amount of soil development has formed only an ochric epipedon and caused some slight accumulation of calcium carbonates or gypsum.

These soils have horizons displaying the weakly expressed morphology of stage I of calcium carbonate accumulation. All of these soil series classify as Entisols (USDA, 1975; USDA, 1992).

The Cairn, Pennell, Sandbench, Shiprock, Tewa, Tohatin, and Wingrock series are older soils than those listed above. They have developed soil structure and undergone significant accumulation and movement of clay, calcium carbonate, or gypsum to form argillic, cambic, calcic, and/or gypsic horizons. These soils have horizons displaying the stage II morphology of calcium carbonate accumulation.

The Mack, Nomrah, Sanostee, and Tsezhin series are old soils and have well expressed argillic and calcic horizons because of the long time interval they have been developing. The Atlatl, Lavellga, and Moffat series are also old soils that have very well developed calcic horizons with high calcium carbonate equivalents. These soils display the stage III morphology of carbonate accumulation which results in Bk horizons that are impregnated and highly whitened by secondary calcium carbonate.

The Chazner and Chinlini series are probably the oldest soils in the survey area and may have begun forming late in the Pleistocene epoch. They have well developed argillic horizons and also have underlying petrocalcic horizons that formed in very gravelly alluvium. These soils display the strongly expressed morphology of stage IV of carbonate accumulation, and have laminar zones or caps on the tops of indurated pans which are root-limiting layers.

References

- Association of State Highway and Transportation Officials. 1986. Standard specifications for highway materials and methods of sampling and testing. Ed. 14, 2 vols.
- Am. Society for Testing and Materials. 1993. Standard classification of soils for engineering purposes. ASTM Stand. D 2487.
- Anderson, D. C., Harper, K. T., and Holmgren, R. C. 1982. Factors influencing development of cryptogamic soil crusts in Utah deserts. *Jour. Range Mgmt.*, vol. 35 (2).
- Armstrong, R. L. 1969. K-Ar dating of laccolithic centers of the Colorado Plateau and vicinity. *Geol. Soc. Am. Bull.*, vol. 80.
- Arrhenius, G. and Bonatti, E. 1965. The Mesa Verde loess. *Memoirs of the Soc. Am. Archaeology*, no. 19; *Am. Antiquity*, vol. 31, no. 2, pt. 2.
- Birkeland, P. W. 1984. *Soils and geomorphology*. 2d ed. Oxford Univ. Pr.
- Blagbrough, J. W. 1967. Cenozoic geology of the Chuska Mountains. In F. D. Trauger (ed.), *Guidebook of Defiance-Zuni-Mt. Taylor region, Arizona and New Mexico*. Guidebook to the 18th field conference of the NM Geol. Soc.
- Brady, N. C. 1974. *The nature and properties of soils* (8th ed.). MacMillan.
- Brotherson, J. D., Rushforth, S. R., and Johansen, J. R. 1983. Effects of long-term grazing on cryptogam crust cover in Navajo National Monument. *AZ Journ. Range Mgmt.*, vol. 36 (5).
- Chenoweth, W. L. and Malan, R. C. 1973. The Uranium deposits of northeastern Arizona. In H. L. James (ed.), *Guidebook of Monument Valley and vicinity, Arizona and Utah*. Guidebook to the 24th field conference of the NM Geol. Society.
- Cooley, M. E., Harshbarger, J. W., Akers, J. P., and Hardt, W. F. 1969. Regional hydrogeology of the Navajo and Hopi Indian reservations, Arizona, New Mexico, and Utah. *U.S. Geol. Surv. Prof. Paper* 521-A.
- Crampton, C. G. 1983. *Standing up country—The canyon lands of Utah and Arizona*. Peregrine Smith Books, Layton, UT.
- Doner, H. E. and Lynn, W. C. 1977. Carbonate, halide, sulfate, and sulfide minerals. In J. B. Dixon and S. B. Weed (ed.), *Minerals in soil environments*. *Soil Sci. Soc. Am.*
- Dunne, J. 1989. Cryptogamic soil crusts in arid ecosystems. *Rangelands. Soc. Range Mgmt.*, vol. 11 (4).

Erdman, J. A., Douglas, C. A., and Marr, J. W. 1969. Environment of Mesa Verde, Colorado. Archeol. Res. Series No. 7-B, Wetherill Mesa Studies, USDI-NPS, Washington, D.C.

Gile, L. H., Hawley, J. W., and Grossman, R. B. 1981. Soils and geomorphology in the basin and range area of Southern New Mexico—Guidebook to the Desert Project. Memoir 39., NM Bur. Mines and Min. Res.

Gregory, H. E. 1917. Geology of the Navajo country. U.S. Geol. Surv. Prof. Paper 93.

Harden, J. W., Taylor, E. M., McFadden, L. D., and Reheis, M. C. 1991. Calcic, gypsic, and siliceous soil chronosequences in arid and semiarid environments. In W. D. Nettleton (ed.), Occurrence, characteristics, and genesis of carbonate, gypsum, and silica accumulations in soils. Soil Sci. Soc. Am. special pub. no. 26.

Harshbarger, J. W., Repenning, C. A., and Irwin, J. H. 1957. Stratigraphy of the uppermost Triassic and the Jurassic rocks of the Navajo country. U.S. Geol. Surv. Prof. Paper 291.

Hawley, J. W. 1986. Physiographic provinces and landforms. In J. L. Williams (ed.), New Mexico in maps. Univ. NM Pr.

Hodgkinson, H. S. 1987. Relationship of saltbush species to soil chemical properties. Journ. Range Mgmt., vol. 40 (1).

Hunt, C. B. 1956. Cenozoic geology of the Colorado Plateau: U.S. Geol. Surv. Prof. Paper 279.

Jenny, H. 1941. Factors of soil formation. McGraw-Hill.

Monger, H. C., Daugherty, L. A., and Gile, L. H. 1991. A Microscopic examination of pedogenic calcite in an aridisol of southern New Mexico. In W. D. Nettleton (ed.), Occurrence, characteristics, and genesis of carbonate, gypsum, and silica accumulations in soils. Soil Sci. Soc. Am. special pub. no. 26.

The Navajo Tribe, Division of Community Development. 1978. Future land use planning, Shiprock, NM.

New Mexico Geological Society. 1982. Geologic highway map of New Mexico. NM Bur. Mines and Min. Res.

O'Sullivan, R. B. and Beikman, H. M. 1963. Geology, structure, and uranium deposits of the Shiprock Quadrangle, New Mexico and Arizona: U.S. Geol. Surv., Misc. Geol. Inv. Map I-345.

Portland Cement Association. 1973. PCA soil primer.

Price, A. B., Nettleton, W. D., Bowman, G. A., and Clay, V. L. 1988. Selected properties, distribution, source, and age of eolian deposits and soils of southwest Colorado. Soil Sci. Soc. Am. Journ. vol. 52.

- Schultz, J. D. 1983. Geomorphology and quaternary history of the southeastern Chaco dune field, northwestern New Mexico. In S. G. Wells, et al. (ed.), Chaco canyon country. 1983 field trip guidebook of the Am. Geomorp. Field Group. Dep. Geol., Univ. NM
- Shainberg, I., Rhoades, J. D., and Prather, R. J. 1981. Effect of low electrolyte concentration on clay dispersion and hydraulic conductivity of a sodic soil. Soil Sci. Soc. Am. Journ. vol. 45.
- Shelton, J. S. 1966. Geology illustrated. W. H. Freeman.
- Stuart, D. E. 1986. Prehistory: Paleo-Indian and archaic sites. p.74-79. In J. L. Williams (ed.), New Mexico in maps, Univ. NM Pr.
- Underhill, R. M. 1956. The Navajos. Univ. of OK Pr.
- United States Department of Agriculture, Soil Conservation Service. 1979. The Desert Project soil monograph.
- United States Department of Agriculture, Soil Conservation Service. 1986. Inventory of Navajo Indian irrigation projects.
- United States Department of Agriculture, Natural Resources Conservation Service. National engineering handbook. (Available in the State offices of the Natural Resources Conservation Service at Albuquerque, NM and Phoenix, AZ)
- United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. (Available in the State offices of the Natural Resources Conservation Service at Albuquerque, NM and Phoenix, AZ.)
- United States Department of Agriculture, Natural Resources Conservation Service. 1997. National soil survey handbook. Title 430-VI, GPO, Washington, D. C.
- United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Dep. Agric. Handb. 210.
- United States Department of Agriculture, Soil Conservation Service. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. U.S. Dep. Agric. Handb. 436.
- United States Department of Agriculture, Soil Conservation Service. 1981. Land resource regions and major land resource areas of the United States. U.S. Dep. Agric. Handb. 296.
- United States Department of Agriculture, Soil Conservation Service. 1991. Soil survey laboratory methods manual. Soil Surv. Invest. Rep. 42.
- United States Department of Agriculture, Soil Conservation Service. 1992. Keys to soil taxonomy. 5th ed. Soil Surv. Staff, Soil Mgmt. Support Serv. Tech. Monogr. 19.

United States Department of Agriculture, Soil Conservation Service. 1993. Soil survey manual. Soil Surv. Staff, U.S. Dep. Agric. Handb. 18.

University of Arizona Press. 1982. Between sacred mountains, Navajo stories and lessons from the land.

Watson, R. A. and Wright Jr., H. E. 1963. Landslides on the east flank of the Chuska Mountains, Northwestern New Mexico. Am. Journ. Sci., vol. 261.

Wilson, J. P. 1967. Military campaigns in the Navajo country, Northwestern New Mexico. Mus. NM Pr., Res. Record no. 5.

Woodward, L. A. 1973. Structural framework and tectonic evolution of the Four Corners region of the Colorado Plateau. In H. L. James (ed.), Guidebook of Monument Valley and vicinity, Arizona and Utah. Guidebook to the 24th field conference of the NM Geol. Soc.

Glossary

Adsorption. The process by which atoms, molecules, or ions are taken up from the soil solution or soil atmosphere and retained on the surfaces of solids by chemical or physical binding.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates are called peds. Clods are aggregates produced by tillage or logging.

Albic horizon. A subsurface horizon from which silicate clay and/or free iron oxides have been removed or the oxides segregated to the extent that the color of the horizon is largely determined by the color of the primary sand and silt particles.

Alluvial cone. The material washed down the sides of mountains and hills by ephemeral streams and deposited in the form of a moderately steep, conical mass descending equally in all directions from the point of issue.

Alluvial fan. The fanlike deposit of a stream where it issues from a gorge upon a plain or of a tributary stream near or at its junction with its main stream.

Alluvium. Soil parent material, such as cobbles, gravel, sand, silt, or clay, deposited on land by flowing water from streams or rivers.

Alpha, alpha-dipyridyl. A clear dye that when dissolved in 1N ammonium acetate is used to detect the presence of reduced iron ions (Fe II) in the soil. A positive reaction to the dye solution is a type of redoximorphic feature.

Animal unit month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions. Current soil wetness characterized by continuous or periodic saturation and reduction. The presence of these

conditions is indicated by redoximorphic features, and can be verified, except in artificially drained soils, by measuring saturation and reduction.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillic horizon. A subsoil horizon characterized by an illuvial accumulation of clay.

Aspect. The direction in which a slope faces.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3.5
Low	3.5 to 5.0
Moderate	5.0 to 7.5
High	7.5 to 10
Very high	more than 10

Backslope. The geomorphic component that forms the steepest inclined surface and principal element of many hillsides. Backslopes in profile are commonly steep, are linear, and may or may not include cliff segments. Backslopes are erosional forms.

Badland. Steep or very steep, commonly nonstony, barren land dissected by many intermittent drainage channels. Badland is most common in semiarid and arid regions where streams are entrenched in soft geologic material. Local relief generally ranges from 25 to 500 feet. Surface runoff potential is very high, and geologic erosion is active.

Basal area. The area of a cross section of a tree,

generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Basalt. Igneous rock formed by the cooling and hardening of a magma associated with volcanic activity and emplaced at or near the earth’s surface.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Bedding planes. Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography. A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Bouldery. Surface phases of soils having boulders on the surface horizon in amounts high enough to interfere with cultivation, harvest, or trafficability. The limits for the phase classes expressed as percent of surface covered are:

Bouldery	0.01 to 0.1
Very bouldery	0.1 to 3
Extremely bouldery	3 to 15
Rubbly	15 to 75
Rubble land	more than 75

Stones may occupy a greater proportion of the surface in these phases so long as the boulders dominate the stones as a limiting factor for use and management. Rubble land is not soil, but rather is treated as a kind of miscellaneous area.

Broad-base terrace. A ridge-type terrace built to control erosion by diverting runoff along the contour at a nonscouring velocity. The terrace is 10 to 20 inches high and 15 to 30 feet wide and has gently sloping sides, a rounded crown, and a dish-shaped channel along the upper side. It may be nearly level or have a grade toward one or both ends.

Breaks. The steep and very steep broken land at the

border of an upland summit that is dissected by ravines.

Breast height. An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Brush management. Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Butte. An isolated, small tableland or volcanic neck with relatively steep slopes and talus or precipitous cliffs and characterized by summit width that is less than the height of bounding escarpments. The small summits are flat in tableland or pointed in volcanic necks. As summit area increases relative to height in tablelands, buttes are transitional to mesas.

Cable yarding. A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, felled trees generally are reeled in while one end is lifted or the entire log is suspended.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Calcic horizon. A subsoil horizon characterized by an illuvial accumulation of secondary calcium carbonate. Calcic horizons are not cemented or indurated to a degree which would be limiting to root growth.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Cambic horizon. A subsoil horizon characterized by loamy texture, soil structure rather than rock structure, and some evidence of alteration such as illuviation of clay or removal and redistribution of calcium carbonate. A cambic horizon can include layers that are part of an ochric epipedon or an albic horizon.

Canyon. A long, deep, narrow, very steep sided valley with high, precipitous walls in an area of high local relief.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles.

Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0). The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Channer. A thin, flat fragment of rock such as sandstone, limestone, slate, schist, or (rarely) basalt, as much as 6 inches along the longest axis.

Channery soil material. Material that is 15 to 35 percent, by volume thin, flat rock fragments, as much as 6 inches (15 centimeters) along the longest axis. Very channery soil material is 35 to 60 percent of these fragments, and extremely channery soil material is more than 60 percent.

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Chroma. The relative purity or strength of a spectral color. Chroma indicates the degree of saturation of neutral gray by the spectral color. (See Munsell notation)

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Claystone. Sedimentary rock which is formed by the hardening of a clay deposit, and has an angular or irregular fracture. It is similar to shale, but lacks the platy lamination or fissility.

Clay depletions. Low-chroma zones having a low content of iron, manganese, and clay because of the chemical reduction of iron and manganese and the removal of iron, manganese, and clay. A type of redoximorphic depletion.

Clay film. A thin coating of illuviated, oriented, silicate clay on the surface face of a soil ped or lining pores. Illuvial clay may also coat surfaces

of rock fragments or form bridges between adjacent rock fragments or sand grains.

Climate factor (C). The climatic characterization of windspeed and surface soil moisture used in the wind erosion equation to determine an erodibility index and hazard of soil blowing classes. The climate factors used in this survey are assigned from estimates of soil moisture and temperature regimes in the following manner:

<i>Soil moist., temp.</i>	<i>Map unit symbols</i>	<i>C factor</i>
Typic aridic, mesic	100 to 295; 500 to 528	120
Ustic aridic, mesic	300 to 320	80
Aridic ustic, mesic	400 to 418	60
Typic ustic, frigid	600 to 712	40

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse textured soil. Sand or loamy sand.

Cobbles. Rounded or partly rounded fragments of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter. An individual piece is a cobble.

Cobbly soil material. Material that is 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

Colluvium. Unsorted soil parent material which was transported and deposited on steep slopes and/or the base of slopes by mass movement (direct gravitational action) and by local, unconcentrated runoff.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions. Cemented bodies with crude internal symmetry organized around a point, a line, or a plane. They typically take the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or

manganese oxide are generally considered a type of redoximorphic concentration.

Conglomerate. A coarse grained, clastic rock composed of rounded or subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer textured material. Conglomerate is the consolidated equivalent of gravel.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the "Soil Survey Manual."

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coppice dune. A small dune of fine grained soil material stabilized around shrubs or small trees.

Corrosion. The potential or risk of soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Cretaceous. The third period of the Mesozoic Era of

geologic time (from approximately 135 to 65 million years ago).

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Cryptogam. The association of certain species of spore producing plants which grow on or directly under the soil surface in arid, semiarid, and subhumid areas. These plants produce algal filaments, fungal mycelia, and exudates that firmly bind and cement soil separates into a dark, lumpy crust. These crusts stabilize the surfaces of many sandy, saline, and gypsiferous soils, helping to protect them from erosion. Cryptogam crusts are easily damaged by excessive foot, hoof, or wheel traffic.

Cuesta. A hill or ridge that has a gentle slope on one side and a steep slope on the other; specifically, an asymmetric, homoclinal ridge capped by resistant rock layers of slight or moderate dip.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Delta. A body of alluvium having a surface that is nearly flat and fan shaped; deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.

Deltaic. A term pertaining to present or past landforms or environments associated with deltas.

Depth class, soil. Generally, the thickness of the soil over root-limiting layers such as bedrock or a pan. Very deep soils are more than 60 inches deep over bedrock or a pan; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Desert pavement. On a desert surface, a layer of gravel or larger fragments that was emplaced by upward movement of the underlying sediments, or that remains after finer particles have been removed by running water or the wind.

Dike. An intrusive, tabular body of igneous rock that cuts across the structure of adjacent rocks or cuts massive rocks.

Dipslope. A slope of the land surface, roughly determined by and approximately conforming to

the dip of the underlying bedrock which has been tilted from the horizontal plane by earth movements such as folding or flexure. (see Cuesta)

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Dome. A smoothly rounded landform or rock mass such as the rock-capped summit of a mountain.

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained. These classes are defined in the “Soil Survey Manual.”

Drainage, surface. Runoff, or surface flow of water, from an area.

Duff. A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian material. Soil parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic

processes acting over long geologic periods and resulting in the wearing away of mountains and tablelands and the building up of such landscape features as flood plains and alluvial fans.

Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Synonym: scarp.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess gypsum (in tables). Excess gypsum in the soil. Gypsum is a corrosion hazard for concrete, and soils high in gypsum may subside if the gypsum is dissolved and removed by water.

Excess lime (in tables). Excess carbonates in the soil that restrict the growth of some plants.

Excess salts (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Excess sodium (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

Fan terrace. A relict alluvial fan, no longer a site of active deposition, incised by younger and lower alluvial surfaces. Older, dissected fan terraces may have a gently sloping, planar summit surface (tread) built by fan deposition, and a steep, descending slope (riser), graded to a lower base level of erosion.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the oven-dry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called normal field capacity, normal moisture capacity, or capillary capacity.

Fill slope. A sloping surface consisting of excavated soil material from a road cut. It commonly is on the downhill side of the road.

Fine textured soil. Sandy clay, silty clay, or clay.

Flaggy soil material. Material that is, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.

Flagstone. A thin fragment of sandstone, limestone, slate, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.

Foothill. A steeply sloping upland that has relief of as much as 1,000 feet (300 meters) and fringes a mountain range or high-plateau escarpment.

Footslope. The geomorphic component that forms the inner, inclined surface at the base of a hill. Footslopes in profile are dominantly concave, and may form transition zones between upslope sites of erosion (backslope) and downslope sites of deposition. (toeslope).

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Formation (stratigraphy). The basic rock-stratigraphic unit in the local classification of rocks. A body of rock (commonly a sedimentary stratum or strata, but also igneous and metamorphic rocks) generally characterized by some degree of internal lithologic homogeneity or distinctive lithologic features (such as chemical composition, structures, textures, or general kind of fossils), by a prevailing (but not necessarily tabular shape), and by mappability at the earth's surface (at scales of the order of 1:25,000) or traceability in the subsurface. Formations may be combined into groups or subdivided into members.

Fragile (in tables). A soil that is easily damaged by use or disturbance.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Geomorphic surface. A mappable area of the earth's surface that has a common history; the area is of similar age and is formed by a set of processes during an episode of landscape evolution. A geomorphic surface can be erosional, constructional, or both. The surface shape can be planar, concave, convex, or any combination of these.

Geomorphology. The science of landforms that treats the general configuration of the earth's surface; especially the study of the classification, description, nature, origin, and development of landforms and their relationships to underlying structures, and of the history of geologic changes as recorded by these surface features. The term is especially applied to the genetic interpretation of landforms.

Gleyed soil material. Soil horizons that formed under saturation with stagnant water, resulting in the reduction of iron and other elements. Gleyed horizons have low chroma and gray matrix colors.

Gravel. Rounded or angular fragments of rock as much as 3 inches (7.6 centimeters) in diameter. An individual piece is a pebble. Very gravelly soil material is 35 to 60 percent of these fragments, and extremely gravelly soil material is more than 60 percent.

Gravelly soil material. Material that is 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Gypsic horizon. A subsoil horizon characterized by an illuvial accumulation of secondary gypsum. Gypsic horizons are not cemented or indurated to a degree which would be limiting to root growth.

Gypsiferous material. Soil material that has more than 10 percent gypsum (hydrous calcium sulfate). Gypsum is a soft, soluble mineral, and soil layers which are gypsiferous material are not represented with entries in the table "Engineering

Index Properties,” except for depth and fragments larger than 3 inches. Such layers are described with apparent USDA textures in the sections “Detailed Soil Map Units” and “Soil Series and Their Morphology.”

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hazard of soil blowing. A narrative term describing the potential of soil surfaces, in cultivated or bare disturbed areas, to blow during periods of strong sustained winds. The soil properties used to determine soil blowing hazard are soil texture, organic matter content, calcium carbonate reaction, rock fragment content, aggregate stability, moisture, and soil loss tolerance (T factor). Wind erodibility index (I value) is intended to represent most of the above permanent properties. Climate factor (C) and wind erodibility index are used, along with soil loss tolerance factor, in the Wind Erosion Equation to determine soil blowing hazard (see Wind erosion equation and Climate factor). In this survey the following five soil blowing hazard classes are recognized based on calculated values from the wind erosion equation and assigned values of wind erodibility index:

Very severe	CxI/T is more than 20 and I is 134 to 310
Severe	 CxI/T is more than 20
Moderate	 CxI/T is 8 to 20
Slight	 CxI/T is less than 8 and I is more than 0
Very slight	 CxI/T is less than 8 and I is 0

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and depends on local usage. Hills commonly have a descending order of geomorphic components that include summits, shoulders, backslopes, footslopes, and toeslopes. However, all of these components are not necessarily present in every hillslope continuum. In addition, these geomorphic components are also used to subdivide broader, more complex landforms such as escarpments, landslides, mountains, and plateaus.

Histic epipedon. A surface horizon composed of organic soil material (peat or muck). Histic epipedons have aquic conditions for some time in most years unless they have been artificially drained.

Holocene. The second epoch of the Quaternary Period of geologic time, extending from the end of the Pleistocene Epoch (about 10 to 12 thousand years ago) to the present.

Horizon, soil. A layer of soil, approximately parallel to the land surface, having distinct characteristics produced by soil-forming processes and differing from adjacent genetically related layers in physical, chemical, and biological factors. In the identification of soil horizons, an uppercase letter represents the master horizons. Numbers or lowercase letters that follow represent subdivisions of the master horizons. An explanation of the subdivisions is given in the “Soil Survey Manual.” The master horizons of mineral soil are as follows:

O horizon.—An organic layer of decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. A horizons exhibit soil structure as well as obliteration of all or much of the original rock structure. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is dominated by the obliteration of all or much of the original rock structure. The B horizon also has distinctive characteristics, such as (1) accumulation of silicate clay, calcium carbonate, gypsum, sodium, or a combination of these; (2) prismatic, granular, columnar, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr layer.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil.

The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Hue. The property of color that is perceived by the eye and measured on the Munsell color system. The Munsell system is based on five principal hues: red (R), yellow (Y), green (G), blue (B), and purple (P). Five intermediate hues representing midpoints between each pair of principal hues complete the 10 major hue names used to describe the notation. The most common intermediate hues in soil are yellow-red (YR) green-yellow (GY), and blue-green (BG). (See Munsell notation.)

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydric soil. A soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic (oxygen-depleted) conditions in the upper part. Hydric soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Hydrophytic vegetation. Plant life growing in water or on a substrate (usually soil) that is at least periodically deficient in oxygen as a result of excessive water content.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate

can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.1	very slow
0.1 to 0.3	slow
0.3 to 0.5	moderately slow
0.5 to 0.75	moderate
0.75 to 1.0	moderately rapid
1.0 to 1.5	rapid
More than 1.5	very rapid

Interdunes. The relatively flat surface, whether sand-free or sand-covered, between dunes.

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Iron depletions. Low-chroma zones having a low content of iron and manganese oxide because of chemical reduction and removal, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic depletion.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:
Border. Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Corrugation. Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle). Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow. Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler. Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Jurassic. The second period of the Mesozoic Era of geologic time (from approximately 195 to 135 million years ago).

Knoll. A small, low, rounded hill rising above adjacent landforms.

Laccolith. An intrusive, mushroom-shaped body of igneous rock that has domed up the overlying rocks into which it was intruded.

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lamellae. The thin, sometimes wavy subhorizons of fine materials that are present in some soils as a result of illuviation. They form when silicate clay is pedogenically concentrated (illuviated) within coarser (e.g. sandy) eluviated horizons. A lamella is a single illuvial horizon less than 7.5 centimeters thick. Lamellae may be present in sufficient thickness and quantity to influence certain soil properties such as water-holding capacity.

Lamina. The thinnest recognizable layer, (commonly less than 1 centimeter thick), of original deposition in a sediment or sedimentary rock, differing from other layers in color, composition, or particle size.

Landform. Any physical, recognizable form or feature on the earth's surface, having a characteristic shape and range in composition, and produced by natural causes. Landforms include a wide range in size and provide an empirical description of similar portions of the earth's surface.

Landslide. A general term for a mass movement landform and a process characterized by moderately rapid to rapid (greater than 30 centimeters per year) downslope transport, by means of gravitational stresses, of a mass of rock and regolith that may or may not be water saturated.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Littoral. A term pertaining to present or past landforms and environments bordering an ocean or inland sea. Examples are beaches, barrier islands, salt marshes, and lagoons.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength (in tables). The soil is not strong enough to support loads.

Marine. A term pertaining to an open ocean or inland sea, and to oceanic conditions in the present or geologic past.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redoximorphic concentration.

Matrix, soil. The dominant volume, in a soil horizon, which is continuous in appearance and envelops microsites.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mesa. A broad, nearly flat topped and commonly isolated upland mass (tableland) characterized by summit widths that are more than the heights of bounding erosional escarpments.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Monocline. A unit of folded strata that flexes from the horizontal in one direction only, and is not part of an anticline or syncline. This structure is typically present in plateau areas where nearly flat strata locally assume steep dips caused by differential vertical movements without faulting.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity,

consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Such colors are described as redoximorphic features if they are the result of soil wetness. Descriptive terms are as follows: abundance—*few*, *common*, and *many*; size—*fine*, *medium*, and *coarse*; and contrast—*faint*, *distinct*, and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Mountain. A natural elevation of the land surface, rising more than 1,000 feet above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides. A mountain can occur as a single, isolated mass or in a group forming a chain or range.

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mudstone. Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Natric horizon. A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules. Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. If formed in place, nodules of iron oxide or manganese oxide are considered types of redoximorphic concentrations.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Ochric epipedon. A surface horizon that is generally thin, dry, light in color, high in value or chroma, and/or low in organic matter. Ochric epipedons include eluvial horizons (such as albic horizons) that are at or near the soil surface.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, cemented pan, indurated calcium carbonate pan, plowpan, and traffic pan.

Parent material. The unconsolidated organic and mineral matter in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called “a soil.” A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Pedogenesis. The term used to connote soil formation. Pedogenic processes, as opposed to geologic processes, are those which involve the soil forming factors in the development and differentiation of soils and their horizons.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affects the specified use.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as “saturated hydraulic conductivity,” which is defined in the “Soil Survey Manual.” In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as “permeability.” Terms describing

permeability, measured in inches per hour, are as follows:

Extremely slow	0.0 to 0.01 inch
Very slow	0.01 to 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Petrocalcic horizon. A subsoil horizon characterized by an illuvial accumulation of secondary calcium carbonate. In a petrocalcic horizon, the carbonates have accumulated to the extent that the horizon is cemented or indurated and is limiting to root growth.

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and surface texture.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plateau. An extensive upland mass (tableland) with relatively flat summit area that is considerably elevated (more than 100 meters) above adjacent lowlands and separated from them on one or more sides by escarpments.

Pleistocene. The first epoch of the Quaternary Period of geologic time, following the Tertiary Pliocene Epoch and preceding the Holocene (from approximately 2 million to 10 thousand years ago).

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid or very rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference

in size of the particles, density can be increased only slightly by compaction.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Porcelanite. Metamorphic rock formed by the baking and fusing of shale and sandstone beds associated with burned coal seams.

Potential native plant community. See Climax plant community.

Potential rooting depth (effective rooting depth).

Depth to which roots could penetrate if the content of moisture in the soil were adequate.

The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Quaternary. The second period of the Cenozoic Era of geologic time, extending from the end of the Tertiary Period (about 2 million years ago) to the present, and comprising two epochs, the Pleistocene (Ice Age) and Holocene (Recent).

Quartzite. Metamorphic rock formed from sandstone by heat, pressure, and strong silica cementation.

Quartz diorite. Igneous rock formed by the cooling and hardening of a magma associated with plutonic activity and intruded at depth below the earth's surface.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands

(prairies), savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	3.4 and lower
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Red beds. Sedimentary strata that are mainly red and are made up largely of sandstone and shale.

Redoximorphic concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redoximorphic depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redoximorphic features. Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha, alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly

continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redoximorphic feature.

Reduction. The gain of one or more electrons by an ion or molecule. The degree of reduction in a soil can be characterized by a direct measurement of oxidation-reduction (redox) potentials. A degree of reduction that results in the transformation of ferric iron (Fe III) to ferrous iron (Fe II) is used to define the characteristic of aquic conditions.

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill generally is a few inches deep and not wide enough to be an obstacle to wheeled and tracked equipment.

Riparian. A term pertaining to plants and animals living on, or adjacent to, the bank or flood plain of an intermittent stream or perennial river.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral particles having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Salic horizon. A mineral soil horizon characterized by an accumulation of salts which are more soluble than gypsum in cold water.

Saline-sodic soil. A soil that contains both soluble salts and exchangeable sodium in amounts that interfere with the growth of most crop plants. The

conductivity of the saturation extract is more than 4 mmhos/cm, and the exchangeable sodium percentage is more than 15 percent (sodium adsorption ratio of 13 or more). Saline-sodic soils typically do not have the poor physical properties characteristic of sodic soils.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Salinity. The degree to which a soil is affected by soluble salts dissolved in water. Salinity is expressed as the electrical conductivity of a saturated extract in millimhos per centimeter (mmhos/cm). The degrees of salinity and their respective electrical conductivity values are:

Nonsaline	less than 2
Very slightly saline	2 to 4
Slightly saline	4 to 8
Moderately saline	8 to 16
Strongly saline	more than 16

Salty water (in tables). Water that is too salty for consumption by livestock.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Scribner rule. A logarithmic rule, developed by J.M. Scribner around 1846, that is a table or formula showing estimated volumes in board feet for various log diameters and lengths.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; siltstone, formed from silt and very fine sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit and having the tendency to split into thin layers (i.e., fissibility).

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shoulder. The geomorphic component that forms the uppermost, inclined surface at the top of a hill. It is dominantly convex in profile, erosional in origin, and comprises a transition zone between summits above, and backslopes below.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen which forms the molecule and compound silicon dioxide, SiO₂. The highly crystalline, common mineral form is called quartz.

Silicate. A compound or mineral that contains silica and a metallic or organic radical. Silicates are the most common soil and rock-forming minerals and constitute over 90 percent of the earth's crust. Most soil clays belong to a class of silicate minerals known as phyllosilicates, which are characterized by having platy cleavage.

Sill. An intrusive body of igneous rock of approximately uniform thickness and relatively thin compared with its lateral extent, which has been emplaced parallel to the bedding of the intruded rocks.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner,

and have similar conservation needs or management requirements for the major land uses in the survey area.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slickrock. An unusual type of Rock outcrop, which commonly occurs in arid, semiarid, (and dry-subhumid) portions of the Canyon Lands and adjacent sections, of the Colorado Plateau physiographic province. It has formed from thick beds of moderately cemented, fine-grained sandstone; and has been sculptured by geologic erosion into smooth-textured, rounded to irregular forms as alcoves, arches, domes, fins, flatirons, knobs, natural bridges, needles, and potholes. Slickrock occurs in sizable areas on the dipslopes of cuestras and monoclines, rims of mesas and plateaus, summits of structural benches, and on canyon headwalls.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slickspot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil generally is silty or clayey, is slippery when wet, and supports little or no vegetation.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodic soil. A soil that contains exchangeable sodium in amounts that interfere with the growth of most

crop plants. Sodic soils have more than 15 percent exchangeable sodium (sodium adsorption ratio of 13 or more) and are also strongly or very strongly alkaline (pH 8.5 or higher). They restrict plant growth because the soil is in poor physical condition as a result of the dispersal of clay particles.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na to Ca + Mg. The degrees of sodicity and their respective ratios are:

Nonsodic	less than 5:1
Slightly sodic	5-13:1
Moderately sodic	13-30:1
Strongly sodic	More than 30:1

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by topography over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rounded or angular fragments of rock 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Surface phases of soils having stones on the surface horizon in amounts high enough to

interfere with cultivation, harvest, or trafficability. The limits for the phase classes, expressed as percentage of surface covered, are:

Stony	0.01 to 0.1
Very stony	0.1 to 3
Extremely stony	3 to 15
Rubbly	15 to 75
Rubble land	more than 75

Rubble land is not soil, but rather is treated as a kind of miscellaneous area.

Stratified. Arranged in strata, or layers. The term refers to either soil or geologic material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Stream terrace. One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel, originally formed near the level of the stream, and representing the dissected remnants of an abandoned flood plain, stream bed, or valley floor produced during a former stage of erosion and deposition. Older and higher stream terraces have a relatively flat summit surface (tread), built by stream deposition, and a steep descending slope (riser), graded to a lower base level of erosion.

Structural bench. A platform-type, nearly level to gently inclined erosional landform developed on resistant strata in areas where geologic erosion has cut into alternating hard and soft rock layers with an essentially horizontal attitude. Structural benches are bedrock-controlled, their profiles are stair-stepped and angular, they commonly have summits of variable width, and they are bounded both above and below by hills or escarpments.

Structure, rock. The primary arrangement of minerals, small particles, and rock fragments which is inherited from the parent material. As opposed to soil structure, rock structure is not formed by the processes of soil formation. Included in the concept of rock structure are the fine stratifications in alluvium and the fissile or angular arrangement of soft rock fragments in some C horizons formed in residuum derived from sedimentary bedrock.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—platy (laminated), prismatic (vertical axis of aggregates longer than horizontal), columnar (prisms with rounded tops), blocky (angular or subangular), and granular. Structureless soils are

either single grained (each grain by itself, as in dune sand) or massive (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the E horizon.

Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Summit. A general term for the top, or highest area of a landform such as a butte, hill, mountain, structural bench, mesa, or plateau. Summits may or may not include distinct crest lines or high points that rise above their general level.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Tableland. A general term for a broad upland mass with nearly level or undulating summit area of large extent and steep slopes descending to surrounding lowlands. Common types of tablelands are plateaus, mesas, and some buttes.

Talus. Fragments of rock and other soil material accumulated by gravity at the foot of cliffs or steep slopes.

Taxadjuncts. Such soils are correlated and named as recognized, existing soil series for the purpose of expediency. They are so like the soils of the named series in morphology, properties, and interpretative behavior that little or nothing is gained by adding a new soil series.

Tertiary. The first period of the Cenozoic Era of geologic time (from approximately 65 to 2 million years ago).

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay

loam, silty clay loam, sandy clay, silty clay, and clay. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material that is too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope. The geomorphic component that forms the outermost, gently-inclined surface at the base of a hill. Toeslopes in profile are gentle and planar, and are constructed by deposition of materials from upslope sites of geologic erosion.

Topography. The relative position and elevations of the natural or manmade features of an area that describe the configuration of its surface.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Triassic. The first period of the Mesozoic Era of geologic time (from approximately 230 to 195 million years ago).

Tuff-breccia. Igneous rock formed by explosive volcanic activity and consisting of more than 50 percent angular rock fragments consolidated with ash. It is commonly the dominant rock present in exposed volcanic necks.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley floor. A general term for the nearly level to gently sloping, bottom surface of a valley. Component landforms include axial stream channels, the flood plain, and in some areas, low stream terraces that may be subject to flooding from tributary streams. (See Wash, Flood plain, and Stream terrace)

Value. The degree of lightness or darkness of a color in relation to a neutral gray scale. (See Munsell notation)

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Volcanic neck. The solidified material which filled a vent or pipe of an extinct volcano.

Wash. The flat-floored channel of an ephemeral stream, commonly with very steep to vertical banks cut in alluvium.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an oven-dry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Wind erosion equation. An equation first defined in the 1985 Food Security Act and used to calculate an erodibility index for highly erodible soil map unit determinations. The equation is climate factor (C) times wind erodibility index value (I) divided by soil loss tolerance factor (T).

Windthrow. The uprooting and tipping over of trees by the wind.

Tables

Table 1.--Temperature and Precipitation

(Recorded in the period 1948-92 at Shiprock, NM; elevation 4,970 ft)

Month	Temperature			Precipitation		
	Average	Average	Average	Average	Average number	Average
	daily	daily	monthly	monthly	of days with	snowfall
	maximum	minimum		total	0.10 inch or more	
	°F	°F	°F	In		In
January---	42.6	15.7	29.1	0.48	1	1.6
February--	50.3	21.2	35.8	0.41	1	0.6
March-----	59.2	26.9	43.0	0.46	1	0.5
April-----	69.8	34.4	52.1	0.38	1	0.0
May-----	78.9	43.3	61.1	0.51	1	0.0
June-----	89.5	51.3	70.4	0.32	0	0.0
July-----	94.3	58.4	76.3	0.63	1	0.0
August-----	91.3	56.5	73.9	0.96	2	0.0
September--	84.5	47.7	65.9	0.61	1	0.0
October---	71.9	35.5	53.7	0.84	1	0.0
November--	55.6	24.8	40.2	0.58	1	0.2
December--	43.7	16.6	30.1	0.61	2	1.0
Year-----	69.3	36.0	52.6	6.79	13	3.9

Table 1.--Temperature and Precipitation--Continued

(Recorded in the period 1963-92 at Teec Nos Pos, AZ;
elevation 5,290 ft)

	Temperature			Precipitation		
Month	Average daily maximum	Average daily minimum	Average monthly	Average monthly total	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	In		In
January---	40.2	18.2	29.2	0.59	2	2.5
February--	49.1	25.1	37.1	0.51	1	0.6
March-----	57.5	32.2	44.9	0.78	2	0.2
April-----	68.0	39.7	53.9	0.45	1	0.0
May-----	77.9	50.3	64.1	0.52	1	0.0
June-----	88.6	59.4	74.0	0.31	1	0.0
July-----	92.8	65.8	79.3	1.03	3	0.0
August----	90.1	63.0	76.6	1.01	2	0.0
September-	81.8	54.5	68.1	0.75	2	0.0
October---	70.1	41.7	55.9	0.76	2	0.0
November--	54.5	30.4	42.4	0.62	2	0.7
December--	42.6	19.8	31.2	0.72	2	1.6
Year-----	67.8	41.7	54.7	8.05	21	5.6

Table 2.--Freeze Dates in Spring and Fall

(Recorded in the period 1948-92 at Shiprock, NM; elevation 4,970 ft)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than---	May 7	May 19	June 5
2 years in 10 later than---	April 28	May 12	May 27
5 years in 10 later than---	April 13	April 27	May 10
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 2	Sept. 26	Sept. 15
2 years in 10 earlier than-	Oct. 10	Oct. 3	Sept. 22
5 years in 10 earlier than-	Oct. 24	Oct. 16	Oct. 4

(Recorded in the period 1963-92 at Teec Nos Pos, AZ;
elevation 5,290 ft)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than---	April 14	May 4	May 11
2 years in 10 later than---	April 7	April 26	May 4
5 years in 10 later than---	March 23	April 11	April 21
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 31	Oct. 21	Sept. 30
2 years in 10 earlier than-	Nov. 4	Oct. 25	Oct. 6
5 years in 10 earlier than-	Nov. 12	Nov. 3	Oct. 18

Table 3.--Growing Season

(Recorded in the period 1949-91 at Shiprock, NM; elevation 4,970 ft)

Probability	Length of growing season in days if daily minimum temperature exceeds--		
	24 °F	28 °F	32 °F
9 years in 10	160	140	119
8 years in 10	171	152	130
5 years in 10	193	173	150
2 years in 10	214	195	171
1 year in 10	225	206	182

(Recorded in the period 1963-92 at Teec Nos Pos, AZ;
elevation 5,290 ft)

Probability	Length of growing season in days if daily minimum temperature exceeds--		
	24 °F	28 °F	32 °F
9 years in 10	206	176	152
8 years in 10	215	186	161
5 years in 10	232	205	180
2 years in 10	249	224	199
1 year in 10	258	234	209

Table 4.--Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Apache County, Arizona	San Juan County, New Mexico	Total	
				Area	Extent
		Acres	Acres	Acres	Pct
100	Werito loam, 1 to 3 percent slopes-----	0	9,333	9,333	0.5
102	Blackston-Camac-Rock outcrop complex, 0 to 60 percent slopes-----	0	8,204	8,204	0.4
105	Hamburn clay loam, 0 to 1 percent slopes-----	0	8,748	8,748	0.5
107	Tocito-Gullied land complex, 1 to 3 percent slopes-----	0	7,702	7,702	0.4
110	Brimhall-Benally-Genats association, 0 to 45 percent slopes-----	0	22,657	22,657	1.2
113	Gyptur very fine sandy loam, 0 to 3 percent slopes-----	0	12,295	12,295	0.7
115	Denazar-Farb fine sands, 0 to 3 percent slopes-----	0	40,022	40,022	2.0
117	Badland-Rock outcrop complex-----	0	9,457	9,457	0.5
120	Nageezi-Denazar association, 1 to 8 percent slopes-----	0	14,519	14,519	0.8
122	Blueflat-Notal association, 2 to 10 percent slopes-----	0	9,887	9,887	0.5
125	Kimbeto loamy fine sand, 0 to 4 percent slopes-----	0	43,640	43,640	2.2
130	Badland-Genats complex, 35 to 60 percent slopes-----	0	10,917	10,917	0.6
133	Razito sand, 1 to 6 percent slopes-----	0	3,015	3,015	0.2
135	Farb-Rock outcrop-Badland complex, 2 to 25 percent slopes-----	0	40,071	40,071	2.0
137	Persayo-Cairn-Patel complex, 1 to 25 percent slopes-----	0	7,774	7,774	0.4
140	Benally loamy sand, 1 to 3 percent slopes, overblown-----	0	6,660	6,660	0.4
142	Bebeevar-Walrees complex, 0 to 2 percent slopes-----	0	7,421	7,421	0.4
145	Razito-Huerfano complex, 0 to 8 percent slopes-----	0	4,852	4,852	0.3
147	Escavada sand, 0 to 1 percent slopes-----	0	665	665	*
150	Chipeta-Badland-Moncisco complex, 2 to 45 percent slopes-----	0	6,413	6,413	0.3
153	Green River-Green River, saline fine sandy loams, 0 to 1 percent slopes-----	0	882	882	*
155	Mesa fine sandy loam, 1 to 4 percent slopes--	0	5,067	5,067	0.3
157	Werjo, saline-Werjo loams, 0 to 1 percent slopes-----	0	901	901	*
160	Notal-Escavada-Riverwash association, 0 to 1 percent slopes-----	0	8,899	8,899	0.5
163	Werlog silty clay loam, 0 to 1 percent slopes	0	294	294	*
165	Jeddito-Escavada association, 0 to 3 percent slopes-----	0	17,045	17,045	0.9
167	Hoskay-Patel-Badland complex, 1 to 25 percent slopes-----	0	5,345	5,345	0.3
170	Notal sandy clay loam, 0 to 1 percent slopes-	0	17,010	17,010	0.9
173	Shiprock fine sandy loam, 1 to 3 percent slopes-----	0	2,332	2,332	0.1
175	Suwanee loam, 0 to 1 percent slopes-----	0	6,885	6,885	0.4
177	Notal silty clay loam, 1 to 3 percent slopes-	0	914	914	*
180	Kimbeto-Huerfano complex, 1 to 4 percent slopes-----	0	26,439	26,439	1.4
183	Gyptur loam, 3 to 15 percent slopes-----	0	732	732	*
190	Jeddito loamy fine sand, 0 to 2 percent slopes-----	0	25,480	25,480	1.4

See footnote at end of table.

Table 4.--Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Apache County, Arizona	San Juan County, New Mexico	Total	
				Area	Extent
		Acres	Acres	Acres	Pct
195	Tewa fine sandy loam, 2 to 15 percent slopes	0	20,041	20,041	1.1
200	Tocito silt loam, 1 to 3 percent slopes-----	0	3,576	3,576	0.2
205	Shiprock-Farb complex, 1 to 5 percent slopes	0	23,346	23,346	1.3
210	Mack-Mesa fine sandy loams, 1 to 4 percent slopes-----	0	8,412	8,412	0.5
215	Persayo-Fordbutte association, 1 to 10 percent slopes-----	0	82,284	82,284	4.0
220	Chinde loam, 0 to 5 percent slopes-----	0	3,130	3,130	0.2
230	Ravola very fine sandy loam, 1 to 3 percent slopes-----	0	40,819	40,819	2.0
235	Wingrock-Rock outcrop association, 4 to 15 percent slopes-----	0	3,218	3,218	0.2
240	Nageezi loamy fine sand, 1 to 6 percent slopes-----	0	14,952	14,952	0.8
245	Tsebitai very fine sandy loam, 1 to 3 percent slopes-----	0	12,801	12,801	0.7
250	Littlehat-Persayo-nataani complex, 1 to 15 percent slopes-----	0	84,524	84,524	4.2
255	Benally fine sandy loam, 1 to 5 percent slopes-----	0	9,921	9,921	0.5
260	Littlehat-Persayo-Badland complex, 3 to 45 percent slopes-----	0	47,792	47,792	2.4
265	Camac-Kimbeto-Badland association, 0 to 50 percent slopes-----	0	25,186	25,186	1.4
270	Fruitland sandy clay loam, 1 to 3 percent slopes-----	0	2,898	2,898	0.2
275	Razito loamy sand, 3 to 5 percent slopes-----	0	561	561	*
285	Water-Riverwash complex-----	0	1,644	1,644	0.1
290	Mesa clay loam, wet, 0 to 1 percent slopes---	0	990	990	0.1
295	Mesa sandy clay loam, wet, 0 to 1 percent slopes-----	0	1,674	1,674	0.1
300	Farview-Rock outcrop complex, 1 to 10 percent slopes-----	170	14,123	14,601	0.8
301	Farview-Sanostee-Rock outcrop association, 1 to 10 percent slopes-----	0	17,499	17,499	1.0
302	Doakum fine sandy loam, 1 to 10 percent slopes-----	0	2,503	2,503	0.1
303	Snapill very fine sandy loam, 1 to 6 percent slopes-----	0	3,773	3,773	0.2
304	Farview-Beclabito-Rock outcrop complex, 1 to 10 percent slopes-----	988	20,776	21,764	1.2
305	Strych-Eagleeye-Rock outcrop complex, 15 to 70 percent slopes-----	3,744	13,369	17,113	0.9
306	Arches-Kitsili-Mido complex, 1 to 25 percent slopes-----	48,475	15,967	64,442	3.5
307	Bodot-Beclabito-Rock outcrop complex, 15 to 65 percent slopes-----	2,775	9,095	11,870	0.6
308	Mcelmo-Farview complex, 2 to 15 percent slopes-----	357	14,798	15,155	0.8
309	Rock outcrop-Rizno complex, 2 to 20 percent slopes-----	33,155	7,077	40,232	2.2
310	Millett-Blanding-Strych association, 2 to 50 percent slopes-----	23,776	10,132	33,908	1.8
311	Kinusta-Eslendo-Rock outcrop complex, 15 to 70 percent slopes-----	11,160	94	11,254	0.6
312	Blanding very fine sandy loam, 2 to 8 percent slopes-----	20,683	2,791	23,474	1.3

See footnote at end of table.

Table 4.--Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Apache County, Arizona	San Juan County, New Mexico	Total	
				Area	Extent
		Acres	Acres	Acres	Pct
313	Marjane-Kitsili complex, 2 to 8 percent slopes-----	9,093	0	9,093	0.5
314	Mido loamy fine sand, 8 to 45 percent slopes-----	6,059	0	6,059	0.3
315	Shoegame-Riverwash complex, 2 to 5 percent slopes-----	3,157	357	3,514	0.2
316	Millett-Strych-Doakum complex, 5 to 65 percent slopes-----	628	13,361	13,989	0.8
317	Toadlena-Eagleys complex, 2 to 60 percent slopes-----	0	6,473	6,473	0.4
318	Camino silty clay loam, 1 to 8 percent slopes-----	0	719	719	*
319	Skyhawk-Lavellga association, 5 to 50 percent slopes-----	352	4,297	4,649	0.3
320	Beclabito-Kinusta-Badland complex, 2 to 45 percent slopes-----	10,594	0	10,594	0.6
400	Wetherill-Atlatl association, 1 to 15 percent slopes-----	3,244	1,670	4,914	0.3
401	Vessilla-Rock outcrop complex, 5 to 25 percent slopes-----	0	2,424	2,424	0.1
402	Chazner very cobbly very fine sandy loam, 5 to 15 percent slopes, extremely stony-----	3,122	65	3,187	0.2
403	Chazner-Katzine complex, 5 to 45 percent slopes-----	9,929	962	10,891	0.6
404	Wetherill-Tsezhin association, 3 to 15 percent slopes-----	21,399	0	21,399	1.2
406	Rock outcrop-Nizhoni complex, 2 to 20 percent slopes-----	15,506	1,844	17,350	0.9
407	Iwela-Nomrah-Vosburg complex, 1 to 40 percent slopes-----	201	23,465	23,666	1.3
408	Nizhoni-Rock outcrop complex, 2 to 15 percent slopes-----	6,460	43	6,503	0.4
409	Chinlini loam, 2 to 6 percent slopes-----	3,224	0	3,224	0.2
410	Wetherill very fine sandy loam, 15 to 60 percent slopes, eroded-----	15,045	464	15,509	0.8
411	Sojourn-Badland complex, 15 to 50 percent slopes-----	13,133	1,803	14,936	0.8
412	Highdye-Menefee association, 5 to 35 percent slopes-----	140	4,379	4,519	0.2
413	Hozho-Quezcan-Rock outcrop complex, 35 to 70 percent slopes-----	7,298	5,823	13,121	0.7
414	Arabrab-Wetherill complex, 3 to 15 percent slopes-----	5,222	73	5,295	0.3
415	Tsezhin extremely cobbly very fine sandy loam, 35 to 70 percent slopes, rubbly-----	6,382	1,243	7,625	0.4
416	Arabrab-Rock outcrop complex, 15 to 60 percent slopes-----	3,838	147	3,985	0.2
417	Wetherill very fine sandy loam, 5 to 25 percent slopes-----	2,989	58	3,047	0.2
418	Menefee-Espiritu-Rock outcrop complex, 35 to 75 percent slopes-----	0	6,077	6,077	0.3
500	Whit very fine sandy loam, 1 to 3 percent slopes-----	9,688	7,913	17,601	1.0
501	Escavada-Riverwash complex, 0 to 1 percent slopes-----	7,920	1,114	9,034	0.5
502	Sogzie loamy fine sand, 1 to 5 percent slopes-----	40,162	3,405	43,567	2.4
503	Claysprings-Badland complex, 35 to 60 percent slopes-----	1,750	1,474	3,224	0.2
504	Tohona-Kimnoli-Claysprings complex, 2 to 45 percent slopes-----	2,394	4,866	7,260	0.4

See footnote at end of table.

Table 4.--Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Apache County, Arizona	San Juan County, New Mexico	Total	
				Area	Extent
		Acres	Acres	Acres	Pct
505	Recapture-Shorthair-Aneth complex, 1 to 8 percent slopes-----	10,758	1,014	11,772	0.6
506	Blackston-Grazane association, 3 to 50 percent slopes-----	8,078	1,226	9,304	0.5
507	Sheppard loamy fine sand, 2 to 8 percent slopes, hummocky-----	28,268	276	28,544	1.6
508	Shalet-Rock outcrop complex, 8 to 45 percent slopes-----	9,413	642	10,055	0.5
509	Trail loamy fine sand, 1 to 3 percent slopes-----	4,990	0	4,990	0.3
510	Aneth loamy fine sand, 1 to 3 percent slopes-----	9,598	0	9,598	0.5
511	Redlands loamy fine sand, 1 to 3 percent slopes-----	11,942	0	11,942	0.7
512	Gotho fine sandy loam, 0 to 2 percent slopes-----	5,204	91	5,295	0.3
513	Sogzie-Aneth association, 2 to 8 percent slopes-----	75,898	0	75,898	4.1
514	Aneth loamy fine sand, 2 to 8 percent slopes, hummocky-----	23,003	0	23,003	1.3
515	Piute-Bluechief-Rock outcrop complex, 2 to 25 percent slopes-----	23,078	0	23,078	1.3
516	Kaito-Claysprings complex, 30 to 65 percent slopes-----	3,510	0	3,510	0.2
517	Moffat loamy fine sand, 1 to 12 percent slopes-----	8,165	0	8,165	0.4
518	Tohatin-Sheppard loamy fine sands, 5 to 35 percent slopes-----	6,806	0	6,806	0.4
519	Shumbegay loamy fine sand, 0 to 8 percent slopes-----	11,573	15	11,573	0.6
520	Rock outcrop-Needle complex, 2 to 20 percent slopes-----	24,224	0	24,224	1.3
521	Sandbench-Sheppard fine sands, 1 to 8 percent slopes-----	18,509	0	18,509	1.0
522	Pennell loamy fine sand, 1 to 6 percent slopes-----	3,380	0	3,380	0.2
523	Tyende-Aneth-Shumbegay loamy fine sands, 1 to 25 percent slopes-----	9,378	0	9,378	0.5
524	Uzaneva clay loam, 0 to 2 percent slopes-----	8,881	0	8,881	0.5
525	Rock outcrop-----	17,929	0	17,929	1.0
526	Sandbench-Rock outcrop-Piute, cool complex, 1 to 8 percent slopes-----	17,418	0	17,418	0.9
527	Outpost sandy clay loam, 0 to 2 percent slopes-----	4,788	0	4,788	0.3
528	Mack fine sandy loam, 1 to 3 percent slopes-----	5,565	0	5,565	0.3
600	Kunz-Yahmore complex, 2 to 35 percent slopes-----	106	7,525	7,631	0.4
602	Bostwick-Canburn complex, 0 to 5 percent slopes-----	348	1,838	2,186	0.1
604	Yahmore-Sandark complex, 1 to 15 percent slopes-----	1,360	2,896	4,256	0.2
606	Narbona-Deza complex, 5 to 50 percent slopes-----	2,000	8,785	10,785	0.6
608	Narbona-Zilditloi complex, 45 to 90 percent slopes-----	7,009	7,238	14,247	0.8
610	Kunz-Xankey complex, 5 to 45 percent slopes-----	3,161	2,394	5,555	0.3
612	Xankey very cobbly loam, 45 to 70 percent slopes, extremely bouldery-----	1,035	1,398	2,433	0.1
614	Kunz-Tuntsa-Yahmore complex, 3 to 45 percent slopes-----	1,366	3,347	4,713	0.3
616	Ligai-Pastorpeak-Rock outcrop complex, 35 to 95 percent slopes-----	29,119	0	29,119	1.6
618	Zibetod-Bigpaw complex, 5 to 35 percent slopes-----	7,287	0	7,287	0.4

Table 4.--Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Apache County, Arizona	San Juan County, New Mexico	Total	
				Area	Extent
		Acres	Acres	Acres	Pct
700	Akhoni-Retaw complex, 0 to 15 percent slopes-	1,296	12,702	13,998	0.8
702	Bikeyah-Berland loams, 1 to 15 percent slopes	985	4,951	5,936	0.3
704	Klizhin-Captom complex, 15 to 60 percent slopes-----	1,763	8,847	10,610	0.6
706	Todacheene-Viewpoint-Owlspring association, 1 to 20 percent slopes-----	815	3,693	4,508	0.2
708	Tunitcha-Bangston association, 35 to 60 percent slopes-----	9,886	9,724	19,610	1.1
710	Akhoni-Klizhin fine sandy loams, 1 to 35 percent slopes-----	6,470	3,691	10,161	0.6
712	Sonsela-Washpass-Viewpoint complex, 20 to 70 percent slopes-----	1,856	1,896	3,752	0.2
W	Water-----	0	162	162	
	Total-----	780,430	1,091,113	1,871,543	100.0

* Less than 0.1 percent.

Table 5.--Land Capability and Yields per Acre of Crops and Pasture

(Yields are those that can be expected under a high level of management. They are for irrigated areas. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil.)

Map symbol and soil name	Land capability	Alfalfa hay	Apples	Cantaloupe	Corn	Pasture
		Tons	Bu	Crates	Bu	AUM
102: Blackston-----	4e	4.00	250.00	---	---	8.00
Camac-----	---	---	---	---	---	---
Rock outcrop-----	---	---	---	---	---	---
153: Green River-----	2e	4.00	325.00	9.00	75.00	10.00
Green River, saline-----	---	---	---	---	---	---
157: Werjo, saline-----	---	---	---	---	---	---
Werjo-----	2e	5.00	325.00	9.00	100.00	12.00
173: Shiprock-----	2e	6.50	650.00	18.00	150.00	13.00
177: Notal-----	3s	2.00	---	---	---	6.00
200: Tocito-----	3e	5.00	485.00	14.00	110.00	12.00
270: Fruitland-----	2e	7.00	650.00	18.00	150.00	14.00
275: Razito-----	4s	4.50	250.00	9.00	75.00	8.00
290: Mesa-----	2e	5.00	485.00	14.00	110.00	12.00
295: Mesa-----	2s	5.50	485.00	14.00	110.00	13.00
524: Uzaneva-----	3s	---	---	---	---	---

Table 6.--Rangeland Productivity and Characteristic Plant Communities

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/acre		Pct	Pct
100: Werito-----	Loamy Upland (sodic) 5-8" p.z.	Favorable	500	galleta		10
		Normal	400	alkali sacaton		25
		Unfavorable	300	mound saltbush		15
				sickle saltbush		5
102: Blackston-----	Sandy Loam Upland (gravelly) 5-8" p.z.	Favorable	550	bottlebrush squirreltail		10
		Normal	450	Indian ricegrass		25
		Unfavorable	350	galleta		15
				sand dropseed		10
				shadscale saltbush		20
Camac-----	Cobbly Slopes 5-8" p.z.	Favorable	450	Indian ricegrass		20
		Normal	350	galleta		20
		Unfavorable	250	alkali sacaton		5
				bud sagebrush		5
				sand dropseed		5
				shadscale saltbush		10
				valley saltbush		15
Rock outcrop----	---	Favorable	0			
		Normal	0			
		Unfavorable	0			
105: Hamburn-----	Saline Bottom 5-8" p.z.	Favorable	2500	bottlebrush squirreltail		10
		Normal	1600	galleta		15
		Unfavorable	800	alkali sacaton		50
				mound saltbush		5
107: Tocito-----	Clay Loam Terrace (sodic) 5-8" p.z.	Favorable	600	bottlebrush squirreltail		5
		Normal	500	galleta		10
		Unfavorable	400	alkali sacaton		40
				mound saltbush		20
Gullied land----	---	Favorable	0			
		Normal	0			
		Unfavorable	0			
110: Brimhall-----	Sandy Loam Upland (saline) 5-8" p.z.	Favorable	550	Indian ricegrass		10
		Normal	450	galleta		15
		Unfavorable	350	alkali sacaton		30
				shadscale saltbush		10
				winterfat		5
Benally-----	Loamy Upland (sodic) 5-8" p.z.	Favorable	500	Indian ricegrass		5
		Normal	400	galleta		5
		Unfavorable	300	alkali sacaton		20
				mound saltbush		15
Genats-----	Breaks 5-8" p.z.	Favorable	300	Indian ricegrass		5
		Normal	225	galleta		10
		Unfavorable	150	alkali sacaton		20
				mound saltbush		5
				sand dropseed		5
				shadscale saltbush		15

Table 6.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/acre		Pct	Pct
113: Gyptur-----	Silty Upland (sodic) 5-8" p.z.	Favorable	500	Indian ricegrass		25
		Normal	400	galleta		5
		Unfavorable	300	alkali sacaton		10
				bud sagebrush		5
				mat saltbush		5
				sickle saltbush		5
				valley saltbush		20
117: Badland-----	---	Favorable	0			
		Normal	0			
		Unfavorable	0			
Rock outcrop---	---	Favorable	0			
		Normal	0			
		Unfavorable	0			
120: Nageezi-----	Sandy Loam Upland 5-8" p.z.	Favorable	550	bottlebrush squirreltail		5
		Normal	400	Indian ricegrass		30
		Unfavorable	300	galleta		15
				fourwing saltbush		5
				sand dropseed		5
				winterfat		5
Denazar-----	Sandy Upland 5-8" p.z.	Favorable	500	Indian ricegrass		30
		Normal	400	galleta		10
		Unfavorable	250	fourwing saltbush		5
				sand dropseed		5
				sandhill muhly		5
				sandy jointfir		15
122: Blueflat-----	Loamy Upland (sodic) 5-8" p.z.	Favorable	500	Indian ricegrass		5
		Normal	400	galleta		10
		Unfavorable	300	alkali sacaton		25
				mound saltbush		20
				sickle saltbush		5
Notal-----	Clay Loam Terrace (sodic) 5-8" p.z.	Favorable	600	galleta		10
		Normal	500	alkali sacaton		30
		Unfavorable	400	greasewood		5
				mound saltbush		25
125: Kimbeto-----	Sandy Loam Upland (saline) 5-8" p.z.	Favorable	550	Indian ricegrass		15
		Normal	450	galleta		10
		Unfavorable	350	alkali sacaton		30
				shadscale saltbush		15
130: Badland-----	---	Favorable	0			
		Normal	0			
		Unfavorable	0			

Table 6.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/acre		Pct	Pct
130: Genats-----	Breaks 5-8" p.z.	Favorable	300	Indian ricegrass		5
		Normal	225	galleta		10
		Unfavorable	150	alkali sacaton		20
				mound saltbush		5
				sand dropseed		5
				shadscale saltbush		15
				sickle saltbush		10
133: Razito-----	Sandy Upland 5-8" p.z.	Favorable	500	Indian ricegrass		30
		Normal	400	galleta		5
		Unfavorable	250	blue grama		5
				broom snakeweed		5
				fourwing saltbush		5
				mesa dropseed		5
				sand dropseed		5
				sandhill muhly		5
135: Farb-----	Sandstone Upland 5-8" p.z.	Favorable	200	Bigelow's sagebrush		10
		Normal	150	bottlebrush squirreltail		5
		Unfavorable	100	Indian ricegrass		25
				New Mexico feathergrass		5
				galleta		15
				Torrey's jointfir		5
				blue grama		5
				broom snakeweed		5
Rock outcrop----	---	Favorable	0			
		Normal	0			
		Unfavorable	0			
Badland-----	---	Favorable	0			
		Normal	0			
		Unfavorable	0			
137: Persayo-----	Silty Shallow (calcareous) 5-8" p.z.	Favorable	350	Indian ricegrass		15
		Normal	250	galleta		10
		Unfavorable	150	other perennial forbs		5
				other perennial grasses		5
				other shrubs		5
Cairn-----	Sandy Loam Upland (gravelly) 5-8" p.z.	Favorable	550	bottlebrush squirreltail		10
		Normal	450	Indian ricegrass		25
		Unfavorable	350	galleta		15
				sand dropseed		5
				shadscale saltbush		20
Patel-----	Silty Upland (sodic) 5-8" p.z.	Favorable	500	bottlebrush squirreltail		5
		Normal	400	Indian ricegrass		20
		Unfavorable	300	galleta		10
				alkali sacaton		10
				shadscale saltbush		5
				valley saltbush		20

Table 6.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/acre		Pct	Pct
140: Benally-----	Sandy Loam Upland (sodic) 5-8" p.z.	Favorable	900	bottlebrush squirreltail		5
		Normal	700	Indian ricegrass		5
		Unfavorable	500	galleta		15
				alkali sacaton		50
				fourwing saltbush		5
				sand dropseed		5
142: Bebeever-----	Sandy Bottom (subirrigated) 5-8" p.z.	Favorable	1700	heath goldenrod		5
		Normal	1500	(var. nauseosa)		
		Unfavorable	600	Fremont's cottonwood		5
				Indian ricegrass		5
				Russian olive		5
				alkali sacaton		20
				inland saltgrass		20
				saltcedar		10
				sand dropseed		5
				stretchberry		5
Walrees-----	Loamy Bottom (subirrigated) 5-8" p.z.	Favorable	2000	Baltic rush		5
		Normal	1500	Fremont's cottonwood		5
		Unfavorable	1000	Russian olive		20
				inland saltgrass		15
				quackgrass		10
				saltcedar		10
				sandbar willow		10
				sedge		5
				western wheatgrass		10
145: Razito-----	Sandy Upland 5-8" p.z.	Favorable	500	Indian ricegrass		30
		Normal	400	galleta		5
		Unfavorable	250	blue grama		5
				broom snakeweed		5
				fourwing saltbush		5
				mesa dropseed		5
				sand dropseed		5
				sandhill muhly		5
Huerfano-----	Loamy Upland (sodic) 5-8" p.z.	Favorable	500	Indian ricegrass		5
		Normal	400	galleta		10
		Unfavorable	300	alkali sacaton		25
				mound saltbush		20
147: Escavada-----	Sandy Bottom 5-8" p.z.	Favorable	1000	heath goldenrod		5
		Normal	850	(var. nauseosa)		
		Unfavorable	600	Indian ricegrass		20
				alkali sacaton		15
				fourwing saltbush		10
				western wheatgrass		20
150: Chipeta-----	Breaks 5-8" p.z.	Favorable	200	bottlebrush squirreltail		5
		Normal	100	Indian ricegrass		5
		Unfavorable	50	galleta		10
				alkali sacaton		15
				mound saltbush		10
				shadscale saltbush		15
				sickle saltbush		10

Table 6.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/acre		Pct	Pct
150: Badland-----	---	Favorable	0			
		Normal	0			
		Unfavorable	0			
Moncisco-----	Porcelanite Hills 5-8" p.z.	Favorable	550	bottlebrush squirreltail		5
		Normal	450	Indian ricegrass		10
		Unfavorable	350	galleta		15
				alkali sacaton		25
				mound saltbush		5
				shadscale saltbush		20
153: Green River----	Salt Meadow 5-8" p.z.	Favorable	1800	alkali sacaton		5
		Normal	1300	inland saltgrass		60
		Unfavorable	800	stretchberry		5
Green River, saline-----	Salt Meadow 5-8" p.z.	Favorable	1800	alkali sacaton		1
		Normal	1300	greasewood		5
		Unfavorable	800	inland saltgrass		55
155: Mesa-----	Loamy Upland 5-8" p.z.	Favorable	550	bottlebrush squirreltail		10
		Normal	450	Greene's rabbitbrush		5
		Unfavorable	350	Indian ricegrass		15
				galleta		20
				blue grama		10
				fourwing saltbush		5
				sand dropseed		5
				winterfat		5
157: Werjo, saline---	Salt Meadow 5-8" p.z.	Favorable	1800	heath goldenrod		5
		Normal	1300	(var. nauseosa)		
		Unfavorable	800	alkali sacaton		5
				fourwing saltbush		5
				greasewood		5
				inland saltgrass		60
				stretchberry		5
Werjo-----	Salt Meadow 5-8" p.z.	Favorable	1800	heath goldenrod		
		Normal	1300	(var. nauseosa)		
		Unfavorable	800	alkali sacaton		5
				fourwing saltbush		5
				greasewood		5
				inland saltgrass		60
				stretchberry		5
160: Notal-----	Clay Loam Terrace (sodic) 5-8" p.z.	Favorable	600	galleta		10
		Normal	500	alkali sacaton		30
		Unfavorable	400	greasewood		5
				mound saltbush		25

Table 6.--Rangeland Productivity and Characteristic Plant Communities-Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/acre		Pct	Pct
160:						
Escavada-----	Sandy Bottom 5-8" p.z.	Favorable	1000	bottlebrush squirreltail		10
		Normal	850	heath goldenrod		5
		Unfavorable	600	(var. nauseosa)		
				Indian ricegrass		20
				alkali sacaton		15
				fourwing saltbush		5
				western wheatgrass		15
Riverwash-----	---	Favorable	0			
		Normal	0			
		Unfavorable	0			
163:						
Werlog-----	Salt Meadow 5-8" p.z.	Favorable	1800	Sandberg Bluegrass		5
		Normal	1300	alkali sacaton		5
		Unfavorable	800	foxtail barley		5
				inland saltgrass		50
				saltsedge		5
165:						
Jeddito-----	Sandy Terrace (sodic) 5-8" p.z.	Favorable	600	bottlebrush squirreltail		5
		Normal	475	Indian ricegrass		20
		Unfavorable	350	galleta		10
				alkali sacaton		20
				greasewood		5
				mound saltbush		20
				other perennial forbs		5
				other perennial grasses		5
				other shrubs		5
Escavada-----	Sandy Bottom 5-8" p.z.	Favorable	1000	bottlebrush squirreltail		10
		Normal	850	heath goldenrod		5
		Unfavorable	600	(var. nauseosa)		
				Indian ricegrass		20
				alkali sacaton		15
				fourwing saltbush		5
				western wheatgrass		15
167:						
Hoskay-----	Silty Upland (sodic) 5-8" p.z.	Favorable	500	bottlebrush squirreltail		5
		Normal	400	Indian ricegrass		25
		Unfavorable	300	galleta		10
				alkali sacaton		5
				valley saltbush		25
Patel-----	Silty Upland (sodic) 5-8" p.z.	Favorable	500	bottlebrush squirreltail		5
		Normal	400	Indian ricegrass		20
		Unfavorable	300	galleta		10
				alkali sacaton		10
				shadscale saltbush		5
				valley saltbush		20
Badland-----	---	Favorable	0			
		Normal	0			
		Unfavorable	0			

Table 6.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/acre		Pct	Pct
170: Notal-----	Clay Loam Terrace (sodic) 5-8" p.z.	Favorable	600	galleta		10
		Normal	500	alkali sacaton		30
		Unfavorable	400	greasewood		5
				mound saltbush		25
173: Shiprock-----	Sandy Loam Upland 5-8" p.z.	Favorable	550	Indian ricegrass		30
		Normal	400	galleta		15
		Unfavorable	300	blue grama		10
				broom snakeweed		5
				fourwing saltbush		5
				sand dropseed		5
175: Suwanee-----	Loamy Bottom 5-8" p.z.	Favorable	1800	bottlebrush squirreltail		5
		Normal	1300	galleta		5
		Unfavorable	800	alkali sacaton		15
				fourwing saltbush		20
				western wheatgrass		25
177: Notal-----	Clay Loam Terrace (sodic) 5-8" p.z.	Favorable	600	galleta		10
		Normal	500	alkali sacaton		30
		Unfavorable	400	greasewood		5
				mound saltbush		25
180: Kimbeto-----	Sandy Loam Upland (saline) 5-8" p.z.	Favorable	550	Indian ricegrass		15
		Normal	450	galleta		10
		Unfavorable	350	alkali sacaton		30
				shadscale saltbush		15
Huerfano-----	Loamy Upland (sodic) 5-8" p.z.	Favorable	500	Indian ricegrass		5
		Normal	400	galleta		10
		Unfavorable	300	alkali sacaton		25
				mound saltbush		20
183: Gyptur-----	Silty Upland (sodic) 5-8" p.z.	Favorable	500	bottlebrush squirreltail		5
		Normal	400	Indian ricegrass		25
		Unfavorable	300	galleta		10
				alkali sacaton		10
				shadscale saltbush		5
				valley saltbush		20
190: Jeddito-----	Loamy Terrace 5-8" p.z.	Favorable	600	Indian ricegrass		30
		Normal	500	galleta		15
		Unfavorable	400	alkali sacaton		5
				blue grama		5
				fourwing saltbush		20
				sand dropseed		5
195: Tewa-----	Loamy Upland 5-8" p.z.	Favorable	550	bottlebrush squirreltail		5
		Normal	450	Indian ricegrass		15
		Unfavorable	350	galleta		25
				alkali sacaton		5
				blue grama		10
				fourwing saltbush		5

Table 6.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/acre		Pct	Pct
195: Gypsum land-----	---	Favorable	500	Indian ricegrass		25
		Normal	400	galleta		5
		Unfavorable	300	alkali sacaton		10
				bud sagebrush		5
				mat saltbush		5
				sickle saltbush		5
				valley saltbush		20
200: Tocito-----	Clay Loam Terrace (sodic) 5-8" p.z.	Favorable	600	bottlebrush squirreltail		5
		Normal	500	galleta		10
		Unfavorable	400	alkali sacaton		40
				mound saltbush		20
205: Shiprock-----	Sandy Loam Upland 5-8" p.z.	Favorable	550	Greene's rabbitbrush		5
		Normal	400	Indian ricegrass		30
		Unfavorable	300	galleta		15
				blue grama		10
				broom snakeweed		5
				fourwing saltbush		5
				sand dropseed		5
Farb-----	Sandstone Upland 5-8" p.z.	Favorable	200	Bigelow's sagebrush		10
		Normal	150	bottlebrush squirreltail		5
		Unfavorable	100	Indian ricegrass		25
				New Mexico feathergrass		5
				galleta		15
				Torrey's jointfir		5
				blue grama		5
				broom snakeweed		5
210: Mack-----	Loamy Upland 5-8" p.z.	Favorable	500	bottlebrush squirreltail		10
		Normal	400	Greene's rabbitbrush		5
		Unfavorable	300	Indian ricegrass		15
				galleta		20
				blue grama		10
				fourwing saltbush		10
				other perennial forbs		5
				other perennial grasses		5
				other shrubs		5
				sand dropseed		5
Mesa-----	Loamy Upland 5-8" p.z.	Favorable	550	bottlebrush squirreltail		10
		Normal	450	Greene's rabbitbrush		5
		Unfavorable	350	Indian ricegrass		15
				galleta		20
				blue grama		10
				fourwing saltbush		5
				sand dropseed		5
				winterfat		5

Table 6.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/acre		Pct	Pct
215: Persayo-----	Silty Shallow 5-8" p.z.	Favorable	300	Indian ricegrass		10
		Normal	200	galleta		10
		Unfavorable	100	alkali sacaton		25
				gyp dropseed		5
				other perennial forbs		5
				other perennial grasses		5
				other shrubs		5
				shadscale saltbush		5
				sickle saltbush		25
Fordbutte-----	Sandy Loam Upland (saline) 5-8" p.z.	Favorable	550	bottlebrush squirreltail		5
		Normal	450	Indian ricegrass		15
		Unfavorable	350	galleta		10
				alkali sacaton		25
				shadscale saltbush		20
				sickle saltbush		5
220: Chinde-----	Saline-Sodic Upland 5-8" p.z.	Favorable	200	bottlebrush squirreltail		5
		Normal	150	Indian ricegrass		5
		Unfavorable	100	alkali sacaton		5
				mat saltbush		70
				sickle saltbush		5
230: Ravola-----	Silty Fan 5-8" p.z.	Favorable	600	bottlebrush squirreltail		5
		Normal	500	Indian ricegrass		10
		Unfavorable	400	galleta		20
				alkali sacaton		30
				mound saltbush		10
				sickle saltbush		10
235: Wingrock-----	Sandy Loam Upland (saline) 5-8" p.z.	Favorable	550	Indian ricegrass		15
		Normal	450	galleta		10
		Unfavorable	350	alkali sacaton		30
				shadscale saltbush		15
Rock outcrop----	---	Favorable	0			
		Normal	0			
		Unfavorable	0			
240: Nageezi-----	Sandy Loam Upland 5-8" p.z.	Favorable	550	bottlebrush squirreltail		5
		Normal	400	Indian ricegrass		30
		Unfavorable	300	galleta		15
				fourwing saltbush		5
				sand dropseed		5
				winterfat		5
245: Tsebitai-----	Silty Upland 5-8" p.z.	Favorable	550	bottlebrush squirreltail		5
		Normal	450	Indian ricegrass		30
		Unfavorable	350	galleta		5
				alkali sacaton		15
				sand dropseed		5
				valley saltbush		15

Table 6.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/acre		Pct	Pct
250:						
Littlehat-----	Saline-Sodic Upland	Favorable	200	bottlebrush squirreltail		5
	5-8" p.z.	Normal	150	Indian ricegrass		5
		Unfavorable	100	alkali sacaton		5
				mat saltbush		70
				valley saltbush		5
Persayo-----	Silty Shallow (calcareous)	Favorable	350	Indian ricegrass		15
	5-8" p.z.	Normal	250	galleta		10
		Unfavorable	150	other perennial forbs		5
				other perennial grasses		5
				other shrubs		5
Nataani-----	Silty Upland 5-8" p.z.	Favorable	550	bottlebrush squirreltail		5
		Normal	450	Indian ricegrass		30
		Unfavorable	350	galleta		10
				alkali sacaton		15
				sand dropseed		5
				valley saltbush		15
255:						
Benally-----	Loamy Upland (sodic)	Favorable	500	Indian ricegrass		5
	5-8" p.z.	Normal	400	galleta		5
		Unfavorable	300	alkali sacaton		25
				mound saltbush		15
				sickle saltbush		10
260:						
Littlehat-----	Saline-Sodic Upland 5-8"	Favorable	200	bottlebrush squirreltail		5
	p.z.	Normal	150	Indian ricegrass		5
		Unfavorable	100	alkali sacaton		5
				mat saltbush		70
				valley saltbush		5
Persayo-----	Silty Shallow (calcareous)	Favorable	350	Indian ricegrass		15
	5-8" p.z.	Normal	250	galleta		10
		Unfavorable	150	other perennial forbs		5
				other perennial grasses		5
				other shrubs		5
Badland-----	---	Favorable	0			
		Normal	0			
		Unfavorable	0			
265:						
Camac-----	Cobbly Slopes 5-8" p.z.	Favorable	450	Indian ricegrass		20
		Normal	350	galleta		20
		Unfavorable	250	alkali sacaton		5
				bud sagebrush		5
				sand dropseed		5
				shadscale saltbush		10
				valley saltbush		15
Kimбето-----	Sandy Loam Upland (saline)	Favorable	550	Indian ricegrass		15
	5-8" p.z.	Normal	450	galleta		15
		Unfavorable	350	alkali sacaton		30
				shadscale saltbush		15
Badland-----	---	Favorable	0			
		Normal	0			
		Unfavorable	0			

Table 6.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/acre		Pct	Pct
270: Fruitland-----	Loamy Upland 5-8" p.z.	Favorable	550	bottlebrush squirreltail		10
		Normal	450	Indian ricegrass		15
		Unfavorable	350	galleta		25
				alkali sacaton		5
				fourwing saltbush		10
275: Razito-----	Sandy Upland 5-8" p.z.	Favorable	500	Indian ricegrass		30
		Normal	400	galleta		5
		Unfavorable	250	blue grama		5
				broom snakeweed		5
				fourwing saltbush		5
				mesa dropseed		5
				sand dropseed		5
				sandhill muhly		5
285: Water-----	---	Favorable	---			
		Normal	---			
		Unfavorable	---			
Riverwash-----	---	Favorable	0			
		Normal	0			
		Unfavorable	0			
290: Mesa-----	Loamy Upland 5-8" p.z.	Favorable	550	bottlebrush squirreltail		10
		Normal	450	Indian ricegrass		15
		Unfavorable	350	galleta		25
				fourwing saltbush		10
295: Mesa-----	Loamy Upland 5-8" p.z.	Favorable	550	bottlebrush squirreltail		10
		Normal	450	Indian ricegrass		15
		Unfavorable	350	galleta		25
				fourwing saltbush		10
300: Farview-----	---	Favorable	---	Bigelow's sagebrush	20	
		Normal	---	Indian ricegrass	10	
		Unfavorable	---	New Mexico feathergrass	20	
				galleta	5	
				Stansbury cliffrose	5	
				blue grama	5	
				broom snakeweed	5	
				thrifty goldenweed	5	
				true mountain mahogany	5	
Rock outcrop----	---	Favorable	---			
		Normal	---			
		Unfavorable	---			

Table 6.--Rangeland Productivity and Characteristic Plant Communities-Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/acre		Pct	Pct
301: Farview-----	---	Favorable	---	Bigelow's sagebrush	20	
		Normal	---	Indian ricegrass	10	
		Unfavorable	---	New Mexico feathergrass	20	
				galleta	5	
				Stansbury cliffrose	5	
				blue grama	5	
				broom snakeweed	5	
				thrifty goldenweed	5	
				true mountain mahogany	5	
Sanostee-----	Sandy Loam Upland 10-14" p.z.	Favorable	900	Bigelow's sagebrush		5
		Normal	650	bottlebrush squirreltail		5
		Unfavorable	400	Indian ricegrass		20
				galleta		15
				Wyoming big sagebrush		5
				blue grama		15
				fourwing saltbush		5
				southwestern rabbitbrush		5
Rock outcrop---	---	Favorable	0			
		Normal	0			
		Unfavorable	0			
302: Doakum-----	Loamy Upland 10-14" p.z.	Favorable	1000	bottlebrush squirreltail		5
		Normal	800	Indian ricegrass		15
		Unfavorable	600	galleta		10
				Wyoming big sagebrush		10
				blue grama		10
				fourwing saltbush		5
				western wheatgrass		15
303: Snapill-----	Loamy Upland 10-14" p.z.	Favorable	1000	bottlebrush squirreltail		10
		Normal	800	Indian ricegrass		10
		Unfavorable	600	galleta		10
				Wyoming big sagebrush		5
				fourwing saltbush		10
				western wheatgrass		20
304: Farview-----	---	Favorable	---	Bigelow's sagebrush	20	
		Normal	---	Indian ricegrass	10	
		Unfavorable	---	New Mexico feathergrass	20	
				galleta	5	
				Stansbury cliffrose	5	
				blue grama	5	
				broom snakeweed	5	
				thrifty goldenweed	5	
				true mountain mahogany	5	
Beclabito-----	Sandy Loam Upland (saline) 10-14" p.z.	Favorable	600	bottlebrush squirreltail		5
		Normal	500	Indian ricegrass		20
		Unfavorable	400	galleta		20
				alkali sacaton		10
				broom snakeweed		5
				shadscale saltbush		15

Table 6.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/acre		Pct	Pct
304: Rock outcrop----	---	Favorable	0			
		Normal	0			
		Unfavorable	0			
305: Strych-----	Breaks 10-14" p.z.	Favorable	850	Bigelow's sagebrush		10
		Normal	650	Desert Needlegrass		5
		Unfavorable	450	needleandthread		10
				Indian ricegrass		10
				New Mexico feathergrass		10
				galleta		5
				Utah juniper		10
				Wyoming big sagebrush		5
				black grama		5
				Mormon tea		5
				muttongrass		10
Eagleeye-----	Clayey Slopes 10-14" p.z.	Favorable	650	Bigelow's sagebrush		5
		Normal	450	bottlebrush squirreltail		5
		Unfavorable	250	Greene's rabbitbrush		5
				Indian ricegrass		10
				galleta		15
				Utah juniper		5
				alkali sacaton		10
				broom snakeweed		5
				erigonum		5
				shadscale saltbush		20
Rock outcrop----	---	Favorable	0			
		Normal	0			
		Unfavorable	0			
306: Arches-----	Shallow Sandy 10-14" p.z.	Favorable	500	Bigelow's sagebrush		15
		Normal	400	Indian ricegrass		15
		Unfavorable	300	New Mexico feathergrass		15
				galleta		10
				Stansbury cliffrose		5
				Utah juniper		5
				antelope bitterbrush		5
				blue grama		10
				Mormon tea		5
				twoneedle pinyon		5
Kitsili-----	Sandy Loam Upland 10-14" p.z.	Favorable	900	Cutler's Mormon tea		5
		Normal	650	Greene's rabbitbrush		5
		Unfavorable	400	needleandthread		15
				Indian ricegrass		20
				galleta		5
				Wyoming big sagebrush		5
				blue grama		15
				broom snakeweed		5
				sand dropseed		5

Table 6.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/acre		Pct	Pct
306: Mido-----	Sandy Upland 10-14" p.z.	Favorable	900	Cutler's Mormon tea		5
		Normal	650	needleandthread		20
		Unfavorable	400	Indian ricegrass		20
				antelope bitterbrush		5
				blue grama		10
				broom snakeweed		5
				fourwing saltbush		5
				sand dropseed		5
				sandhill muhly		5
307: Bodot-----	Clayey Slopes (bouldery) 10-14" p.z.	Favorable	550	black sagebrush		5
		Normal	450	Bigelow's sagebrush		10
		Unfavorable	350	Indian ricegrass		10
				galleta		15
				black grama		5
				saline wildrye		30
				shadscale saltbush		10
Beclabito-----	Stony Slopes 10-14" p.z.	Favorable	550	Indian ricegrass		10
		Normal	450	New Mexico feathergrass		5
		Unfavorable	350	galleta		25
				alkali sacaton		15
				broom snakeweed		5
				shadscale saltbush		15
Rock outcrop----	---	Favorable	0			
		Normal	0			
		Unfavorable	0			
308: Mcelmo-----	Clayey Upland (sodic) 10-14" p.z.	Favorable	350	galleta		40
		Normal	250	alkali sacaton		15
		Unfavorable	150	desert seepweed		5
				mound saltbush		10
				sand dropseed		5
				shadscale saltbush		10
Farview-----	Sandstone Upland 10-14" p.z.	Favorable	---	Bigelow's sagebrush	20	
		Normal	---	Indian ricegrass	10	
		Unfavorable	---	New Mexico feathergrass	20	
				galleta	5	
				Stansbury cliffrose	5	
				blue grama	5	
				broom snakeweed	5	
				thrifty goldenweed	5	
				true mountain mahogany	5	
309: Rock outcrop----	---	Favorable	---			
		Normal	---			
		Unfavorable	---			

Table 6.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/acre		Pct	Pct
309: Rizno-----	---	Favorable	---	Bigelow's sagebrush	15	
		Normal	---	Indian ricegrass	10	
		Unfavorable	---	New Mexico feathergrass	10	
				galleta	5	
				Stansbury cliffrose	20	
				blue grama	5	
				broom snakeweed	5	
				Mormon tea	5	
				southwestern rabbitbrush	5	
310: Millett-----	Loamy Upland (gravelly) 10-14" p.z.	Favorable	800	bottlebrush squirreltail		5
		Normal	600	needleandthread		25
		Unfavorable	400	Indian ricegrass		10
				galleta		15
				Utah juniper		10
				Wyoming big sagebrush		5
				blue grama		5
				broom snakeweed		5
				winterfat		5
Blanding-----	Loamy Upland 10-14" p.z.	Favorable	1000	bottlebrush squirreltail		10
		Normal	800	needleandthread		10
		Unfavorable	600	Indian ricegrass		10
				galleta		15
				Wyoming big sagebrush		10
				blue grama		10
				broom snakeweed		5
				western wheatgrass		10
Strych-----	Cobbly Slopes 10-14" p.z.	Favorable	800	needleandthread		25
		Normal	600	Indian ricegrass		10
		Unfavorable	400	galleta		10
				Utah juniper		10
				Wyoming big sagebrush		5
				black grama		10
				blue grama		5
				sand dropseed		5
311: Kinusta-----	Breaks 10-14" p.z.	Favorable	850	Bigelow's sagebrush		5
		Normal	650	bottlebrush squirreltail		5
		Unfavorable	450	needleandthread		5
				Indian ricegrass		15
				galleta		15
				Torrey's jointfir		10
				Utah juniper		5
				antelope bitterbrush		5
				broom snakeweed		5
				muttongrass		10
				narrowleaf yucca		5

Table 6.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/acre		Pct	Pct
311:						
Eslendo-----	Clayey Slopes (bouldery) 10-14" p.z.	Favorable	550	Indian ricegrass		5
		Normal	450	Wyoming big sagebrush		10
		Unfavorable	350	Mormon tea		5
				muttongrass		15
				plains bluegrass		5
				roundleaf buffaloberry		5
				saline wildrye		30
Rock outcrop---	---	Favorable	0			
		Normal	0			
		Unfavorable	0			
312:						
Blanding-----	Loamy Upland 10-14" p.z.	Favorable	1000	bottlebrush squirreltail		10
		Normal	800	needleandthread		10
		Unfavorable	600	Indian ricegrass		10
				galleta		15
				Wyoming big sagebrush		10
				blue grama		10
				broom snakeweed		5
				western wheatgrass		10
313:						
Marjane-----	Sandy Loam Upland 10-14" p.z.	Favorable	900	Cutler's Mormon tea		5
		Normal	650	Greene's rabbitbrush		5
		Unfavorable	400	needleandthread		15
				Indian ricegrass		25
				galleta		5
				Wyoming big sagebrush		5
				blue grama		10
				broom snakeweed		5
				sand dropseed		5
Kitsili-----	Sandy Loam Upland 10-14" p.z.	Favorable	900	Cutler's Mormon tea		5
		Normal	650	Greene's rabbitbrush		5
		Unfavorable	400	needleandthread		15
				Indian ricegrass		20
				galleta		5
				Wyoming big sagebrush		5
				blue grama		15
				broom snakeweed		5
				sand dropseed		5
314:						
Mido-----	Sandy Upland 10-14" p.z.	Favorable	900	Cutler's Mormon tea		
		Normal	650	needleandthread		20
		Unfavorable	400	Indian ricegrass		20
				antelope bitterbrush		5
				blue grama		10
				broom snakeweed		5
				fourwing saltbush		5
				sand dropseed		5
				sandhill muhly		5

Table 6.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/acre		Pct	Pct
315: Shoegame-----	Sandy Terrace (stony) 10-14" p.z.	Favorable	1000	Fendler threeawn		5
		Normal	650	Indian ricegrass		20
		Unfavorable	400	galleta		10
				Utah juniper		10
				Wyoming big sagebrush		5
				blue grama		10
				broom snakeweed		5
				sand dropseed		10
Riverwash-----	---	Favorable	0			
		Normal	0			
		Unfavorable	0			
316: Millett-----	Cobbly Slopes 10-14" p.z.	Favorable	800	bottlebrush squirreltail		5
		Normal	600	needleandthread		10
		Unfavorable	400	Indian ricegrass		20
				galleta		15
				Utah juniper		5
				black grama		5
				blue grama		10
				broom snakeweed		5
				plains pricklypear		5
Strych-----	Breaks 10-14" p.z.	Favorable	850	Bigelow's sagebrush		10
		Normal	650	Desert Needlegrass		5
		Unfavorable	450	needleandthread		10
				Indian ricegrass		10
				New Mexico feathergrass		10
				galleta		5
				Utah juniper		10
				Wyoming big sagebrush		5
				black grama		5
				Mormon tea		5
				muttongrass		10
Doakum-----	Loamy Upland 10-14" p.z.	Favorable	1000	needleandthread		5
		Normal	800	Indian ricegrass		10
		Unfavorable	600	galleta		15
				Wyoming big sagebrush		5
				blue grama		20
				fourwing saltbush		5
				sand dropseed		5
				western wheatgrass		5
317: Toadlena-----	Silty Shallow 10-14" p.z.	Favorable	450	Bigelow's sagebrush		5
		Normal	350	Indian ricegrass		10
		Unfavorable	250	galleta		20
				Torrey's jointfir		5
				alkali sacaton		20
				blue grama		5
				shadscale saltbush		5
				winterfat		5

Table 6.--Rangeland Productivity and Characteristic Plant Communities-Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/acre		Pct	Pct
317: Eagleye-----	Clayey Slopes 10-14" p.z.	Favorable	650	Bigelow's sagebrush		5
		Normal	450	bottlebrush squirreltail		5
		Unfavorable	250	Greene's rabbitbrush		5
				Indian ricegrass		10
				galleta		15
				Utah juniper		5
				alkali sacaton		10
				broom snakeweed		5
				erigonum		5
				shadscale saltbush		20
318: Camino-----	Clay Loam Upland 10-14" p.z.	Favorable	700	bottlebrush squirreltail		5
		Normal	550	Indian ricegrass		5
		Unfavorable	400	galleta		20
				alkali sacaton		30
				blue grama		10
				broom snakeweed		5
				mound saltbush		5
319: Skyhawk-----	Cobbly Slopes 10-14" p.z.	Favorable	800	Indian ricegrass		10
		Normal	600	New Mexico feathergrass		25
		Unfavorable	400	galleta		15
				Utah juniper		5
				black grama		5
				blue grama		15
				broom snakeweed		5
				fourwing saltbush		5
				shadscale saltbush		5
Lavellga-----	Loamy Upland (gravelly) 10-14" p.z.	Favorable	800	Indian ricegrass		10
		Normal	600	New Mexico feathergrass		35
		Unfavorable	400	galleta		10
				Utah juniper		5
				blue grama		10
				broom snakeweed		5
				fourwing saltbush		5
320: Beclabito-----	Sandy Loam Upland (saline) 10-14" p.z.	Favorable	600	bottlebrush squirreltail		5
		Normal	500	Indian ricegrass		10
		Unfavorable	400	galleta		20
				alkali sacaton		25
				blue grama		10
				broom snakeweed		5
				shadscale saltbush		15
Kinusta-----	Breaks 10-14" p.z.	Favorable	850	Bigelow's sagebrush		5
		Normal	650	bottlebrush squirreltail		5
		Unfavorable	450	needleandthread		5
				Indian ricegrass		15
				galleta		15
				Torrey's jointfir		10
				Utah juniper		5
				antelope bitterbrush		5
				broom snakeweed		5
				muttongrass		10
				narrowleaf yucca		5

Table 6.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/acre		Pct	Pct
320: Badland-----	---	Favorable	0			
		Normal	0			
		Unfavorable	0			
400: Wetherill-----	---	Favorable	---	bottlebrush squirreltail	5	
		Normal	---	Wyoming big sagebrush	15	
		Unfavorable	---	antelope bitterbrush	15	
				banana yucca	5	
				Mormon tea	5	
				muttongrass	10	
Atlantl-----	---	Favorable	---	bottlebrush squirreltail	5	
		Normal	---	Indian ricegrass	10	
		Unfavorable	---	banana yucca	5	
				milkvetch	5	
				Mormon tea	15	
				muttongrass	10	
				penstemon	5	
				plains pricklypear	5	
				southwestern rabbitbrush	5	
				thrifty goldenweed	10	
401: Vessilla-----	---	Favorable	---	bottlebrush squirreltail	5	
		Normal	---	Greene's rabbitbrush	5	
		Unfavorable	---	Indian ricegrass	10	
				Wyoming big sagebrush	10	
				banana yucca	5	
				broom snakeweed	5	
				Mormon tea	10	
				muttongrass	10	
				thrifty goldenweed	10	
Rock outcrop---	---	Favorable	---			
		Normal	---			
		Unfavorable	---			
402: Chazner-----	---	Favorable	---	black sagebrush	15	
		Normal	---	bottlebrush squirreltail	5	
		Unfavorable	---	Wyoming big sagebrush	15	
				banana yucca	5	
				blue grama	5	
				Mormon tea	5	
				muttongrass	10	
403: Chazner-----	---	Favorable	---	black sagebrush	15	
		Normal	---	bottlebrush squirreltail	5	
		Unfavorable	---	Wyoming big sagebrush	15	
				banana yucca	5	
				blue grama	5	
				Mormon tea	5	
				muttongrass	10	

Table 6.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/acre		Pct	Pct
403: Katzine-----	---	Favorable	---	black sagebrush	20	
		Normal	---	Indian ricegrass	15	
		Unfavorable	---	galleta	5	
				Stansbury cliffrose	5	
				Wyoming big sagebrush	10	
				blue grama	5	
				Mormon tea	5	
				muttongrass	10	
404: Wetherill-----	---	Favorable	---	bottlebrush squirreltail	5	
		Normal	---	Wyoming big sagebrush	15	
		Unfavorable	---	antelope bitterbrush	15	
				banana yucca	5	
				Mormon tea	5	
				muttongrass	10	
Tsezhin-----	---	Favorable	---	black sagebrush	20	
		Normal	---	bottlebrush squirreltail	10	
		Unfavorable	---	Stansbury cliffrose	5	
				Wyoming big sagebrush	5	
				banana yucca	5	
				blue grama	5	
				muttongrass	10	
				toadflax penstemon	5	
406: Rock outcrop----	---	Favorable	---			
		Normal	---			
		Unfavorable	---			
Nizhoni-----	---	Favorable	---	muttongrass	10	
		Normal	---	Indian ricegrass	5	
		Unfavorable	---	blue grama	5	
				mountainmahogany	10	
				Wyoming big sagebrush	10	
				cliffrose	5	
				Utah snowberry	5	
				Mormon tea	5	
				singleleaf ash	5	
407: Iwela-----	---	Favorable	---	black sagebrush	15	
		Normal	---	bottlebrush squirreltail	5	
		Unfavorable	---	galleta	5	
				Wyoming big sagebrush	15	
				blue grama	10	
				broom snakeweed	5	
				muttongrass	10	
				thrifty goldenweed	5	
Nomrah-----	---	Favorable	---	black sagebrush	10	
		Normal	---	bottlebrush squirreltail	10	
		Unfavorable	---	galleta	5	
				Wyoming big sagebrush	20	
				blue grama	10	
				broom snakeweed	5	
				muttongrass	20	

Table 6.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/acre		Pct	Pct
407: Vosburg-----	Loamy Upland 12-16" p.z.	Favorable	1200	bottlebrush squirreltail		1
		Normal	850	Indian ricegrass		5
		Unfavorable	500	galleta		5
				Wyoming big sagebrush		15
				blue grama		10
				broom snakeweed		5
				western wheatgrass		25
408: Nizhoni-----	---	Favorable	---	muttongrass	15	
		Normal	---	blue grama	5	
		Unfavorable	---	Wyoming big sagebrush	20	
				cliffrose	20	
				Mormon tea	5	
				broom snakeweed	5	
Rock outcrop---	---	Favorable	---			
		Normal	---			
		Unfavorable	---			
409: Chinlini-----	Loamy Upland 12-16" p.z.	Favorable	1200	bottlebrush squirreltail		10
		Normal	850	needleandthread		5
		Unfavorable	500	Indian ricegrass		10
				Wyoming big sagebrush		15
				blue grama		10
				muttongrass		10
				western wheatgrass		20
410: Wetherill-----	---	Favorable	---	bottlebrush squirreltail	5	
		Normal	---	Indian ricegrass	10	
		Unfavorable	---	Stansbury cliffrose	5	
				Wyoming big sagebrush	20	
				antelope bitterbrush	20	
				Mormon tea	5	
				muttongrass	10	
				sulphur wildbuckwheat	5	
411: Sojourn-----	---	Favorable	---	bottlebrush squirreltail	5	
		Normal	---	Indian ricegrass	5	
		Unfavorable	---	Stansbury cliffrose	15	
				Utah serviceberry	15	
				Utah snowberry	10	
				Mormon tea	10	
				muttongrass	10	
				true mountain mahogany	10	
Badland-----	---	Favorable	---			
		Normal	---			
		Unfavorable	---			

Table 6.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/acre		Pct	Pct
412: Highdye-----	---	Favorable	---	bottlebrush squirreltail	10	
		Normal	---	Gambel's oak	10	
		Unfavorable	---	Ross' sedge	5	
				Stansbury cliffrose	5	
				blue grama	5	
				broom snakeweed	5	
				muttongrass	30	
				thrifty goldenweed	10	
				true mountain mahogany	5	
Menefee-----	---	Favorable	---	bottlebrush squirreltail	5	
		Normal	---	thrifty goldenweed	5	
		Unfavorable	---	Datil yucca	10	
				green Mormon tea	10	
				true mountainmahogany	30	
				Utah serviceberry	20	
				broom snakeweed	5	
413: Hozho-----	---	Favorable	---	Indian ricegrass	15	
		Normal	---	antelope bitterbrush	50	
		Unfavorable	---	blue grama	5	
				muttongrass	5	
				narrowleaf yucca	5	
				true mountain mahogany	15	
Quezcan-----	---	Favorable	---	bottlebrush squirreltail	5	
		Normal	---	Indian ricegrass	10	
		Unfavorable	---	Utah serviceberry	5	
				antelope bitterbrush	10	
				muttongrass	10	
				saline wildrye	5	
				thrifty goldenweed	5	
				true mountain mahogany	40	
Rock outcrop----	---	Favorable	---			
		Normal	---			
		Unfavorable	---			
414: Arabrab-----	---	Favorable	---	black sagebrush	25	
		Normal	---	Utah serviceberry	5	
		Unfavorable	---	banana yucca	5	
				dwarf lousewort	5	
				muttongrass	30	
				shrub live oak	5	
				silvery lupine	5	
				toadflax penstemon	5	
Wetherill-----	---	Favorable	---	bottlebrush squirreltail	5	
		Normal	---	Gambel's oak	5	
		Unfavorable	---	Wyoming big sagebrush	30	
				banana yucca	5	
				dwarf lousewort	5	
				muttongrass	25	
				silvery lupine	5	

Table 6.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/acre		Pct	Pct
415: Tsezhin-----	---	Favorable	---	black sagebrush	30	
		Normal	---	bottlebrush squirreltail	5	
		Unfavorable	---	Utah serviceberry	5	
				big sagebrush	5	
				Mormon tea	5	
				muttongrass	25	
				thrifty goldenweed	5	
416: Arabrab-----	---	Favorable	---	black sagebrush	30	
		Normal	---	bottlebrush squirreltail	5	
		Unfavorable	---	Utah serviceberry	5	
				banana yucca	5	
				cliff fendlerbush	5	
				muttongrass	25	
				toadflax penstemon	5	
Rock outcrop----	---	Favorable	---			
		Normal	---			
		Unfavorable	---			
417: Wetherill-----	---	Favorable	---	Gambel's oak	30	
		Normal	---	Utah serviceberry	5	
		Unfavorable	---	Wyoming big sagebrush	5	
				banana yucca	10	
				cliff fendlerbush	5	
				muttongrass	10	
418: Menefee-----	---	Favorable	---	Gambel's oak	10	
		Normal	---	Utah serviceberry	20	
		Unfavorable	---	cliff fendlerbush	5	
				muttongrass	10	
				narrowleaf yucca	5	
				true mountain mahogany	30	
Espiritu-----	---	Favorable	---	Gambel's oak	5	
		Normal	---	Indian ricegrass	5	
		Unfavorable	---	Utah serviceberry	20	
				banana yucca	5	
				muttongrass	20	
				narrowleaf yucca	5	
				true mountain mahogany	25	
Rock outcrop----	---	Favorable	---			
		Normal	---			
		Unfavorable	---			
500: Whit-----	Loamy Upland 6-10" p.z.	Favorable	700	bottlebrush squirreltail		10
		Normal	500	Indian ricegrass		10
		Unfavorable	300	galleta		20
				blue grama		10
				broom snakeweed		5
				fourwing saltbush		10
				sand dropseed		5
				winterfat		5

Table 6.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/acre		Pct	Pct
501:						
Escavada-----	Sandy Bottom 6-10" p.z.	Favorable	1100	bottlebrush squirreltail		5
		Normal	900	heath goldenrod		5
		Unfavorable	800	(var. nauseosa)		
				Indian ricegrass		20
				alkali sacaton		10
				fourwing saltbush		10
				sand dropseed		5
				western wheatgrass		15
Riverwash-----	---	Favorable	0			
		Normal	0			
		Unfavorable	0			
502:						
Sogzie-----	Sandy Loam Upland 6-10" p.z.	Favorable	700	bottlebrush squirreltail		5
		Normal	500	Cutler's Mormon tea		5
		Unfavorable	350	Indian ricegrass		30
				galleta		15
				blue grama		10
				winterfat		5
503:						
Claysprings----	Clayey Slopes (bouldery) 6-10" p.z.	Favorable	400	bottlebrush squirreltail		5
		Normal	300	Indian ricegrass		10
		Unfavorable	200	galleta		30
				alkali sacaton		10
				bud sagebrush		10
				mound saltbush		5
				shadscale saltbush		15
Badland-----	---	Favorable	0			
		Normal	0			
		Unfavorable	0			
504:						
Tohona-----	Clayey Upland (sodic) 6-10" p.z.	Favorable	300	bottlebrush squirreltail		5
		Normal	200	galleta		30
		Unfavorable	100	alkali sacaton		10
				mound saltbush		20
				sand dropseed		5
				shadscale saltbush		10
Kimnoli-----	Sandstone Upland 6-10" p.z.	Favorable	450	Bigelow's sagebrush		10
		Normal	350	Indian ricegrass		15
		Unfavorable	250	New Mexico feathergrass		5
				galleta		20
				alkali sacaton		5
				broom snakeweed		5
				shadscale saltbush		5
Claysprings----	Clayey Slopes (bouldery) 6-10" p.z.	Favorable	400	bottlebrush squirreltail		5
		Normal	300	Indian ricegrass		10
		Unfavorable	200	galleta		30
				alkali sacaton		10
				bud sagebrush		10
				mound saltbush		5
				shadscale saltbush		15

Table 6.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/acre		Pct	Pct
505:						
Recapture-----	Sandy Loam (sodic) 6-10" p.z.	Favorable	550	Indian ricegrass		25
		Normal	450	galleta		10
		Unfavorable	350	alkali sacaton		35
				broom snakeweed		5
Shorthair-----	Loamy Upland (sodic) 6-10" p.z.	Favorable	350	Indian ricegrass		5
		Normal	250	galleta		15
		Unfavorable	150	alkali sacaton		25
				mound saltbush		20
				shadscale saltbush		10
Aneth-----	Sandy Upland 6-10" p.z.	Favorable	700	Cutler's Mormon tea		5
		Normal	500	needleandthread		10
		Unfavorable	300	Indian ricegrass		30
				galleta		10
				broom snakeweed		5
				sand dropseed		10
				sandhill muhly		5
506:						
Blackston-----	Sandy Loam Upland 6-10" p.z.	Favorable	700	bottlebrush squirreltail		5
		Normal	500	Cutler's Mormon tea		5
		Unfavorable	350	Indian ricegrass		40
				galleta		20
				fourwing saltbush		5
				sand dropseed		5
Grazane-----	Cobbly Slopes 6-10" p.z.	Favorable	450	bottlebrush squirreltail		5
		Normal	350	Indian ricegrass		20
		Unfavorable	250	galleta		20
				black grama		5
				broom snakeweed		5
				sand dropseed		10
				shadscale saltbush		10
507:						
Sheppard-----	Sandy Upland 6-10" p.z.	Favorable	700	Cutler's Mormon tea		10
		Normal	500	needleandthread		5
		Unfavorable	300	Indian ricegrass		25
				galleta		10
				blue grama		5
				broom snakeweed		5
				sand dropseed		5
				sandhill muhly		5
				spike dropseed		5
508:						
Shalet-----	Breaks 6-10" p.z.	Favorable	500	Bigelow's sagebrush		5
		Normal	350	bottlebrush squirreltail		10
		Unfavorable	200	Indian ricegrass		15
				galleta		20
				Torrey's jointfir		5
				alkali sacaton		5
				broom snakeweed		5
				shadscale saltbush		15
Rock outcrop----	---	Favorable	0			
		Normal	0			
		Unfavorable	0			

Table 6.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/acre		Pct	Pct
509:						
Trail-----	Sandy Terrace 6-10" p.z.	Favorable	750	bottlebrush squirreltail		10
		Normal	550	Indian ricegrass		20
		Unfavorable	350	galleta		15
				broom snakeweed		5
				fourwing saltbush		5
				sand dropseed		15
510:						
Aneth-----	Sandy Terrace 6-10" p.z.	Favorable	750	bottlebrush squirreltail		5
		Normal	550	Indian ricegrass		25
		Unfavorable	350	galleta		20
				fourwing saltbush		10
				sand dropseed		5
				winterfat		5
511:						
Redlands-----	Loamy Upland 6-10" p.z.	Favorable	700	bottlebrush squirreltail		10
		Normal	500	Indian ricegrass		10
		Unfavorable	300	galleta		20
				alkali sacaton		10
				fourwing saltbush		10
				winterfat		5
512:						
Gotho-----	Sandy Terrace (sodic) 6-10" p.z.	Favorable	800	bottlebrush squirreltail		5
		Normal	600	Indian ricegrass		5
		Unfavorable	400	galleta		15
				alkali sacaton		15
				greasewood		50
513:						
Sogzie-----	Sandy Loam Upland 6-10" p.z.	Favorable	700	bottlebrush squirreltail		5
		Normal	500	Cutler's Mormon tea		5
		Unfavorable	350	Indian ricegrass		30
				galleta		15
				broom snakeweed		5
				narrowleaf yucca		5
				sand dropseed		5
Aneth-----	Sandy Upland 6-10" p.z.	Favorable	700	Cutler's Mormon tea		5
		Normal	500	needleandthread		10
		Unfavorable	300	Indian ricegrass		30
				galleta		10
				broom snakeweed		5
				sand dropseed		10
				sandhill muhly		5
514:						
Aneth-----	Sandy Upland 6-10" p.z.	Favorable	700	Cutler's Mormon tea		5
		Normal	500	needleandthread		10
		Unfavorable	300	Indian ricegrass		30
				galleta		10
				broom snakeweed		5
				sand dropseed		10
				sandhill muhly		5

Table 6.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/acre		Pct	Pct
515:						
Piute-----	Sandstone Upland	Favorable	450	Bigelow's sagebrush		5
	(calcareous) 6-10" p.z.	Normal	250	Eastwood's sandwort		5
		Unfavorable	150	Indian ricegrass		15
				New Mexico feathergrass		5
				galleta		5
				Torrey's jointfir		5
				black grama		5
				blackbrush		45
Bluechief-----	Sandy Loam Upland	Favorable	550	Cutler's Mormon tea		5
	(calcareous) 6-10" p.z.	Normal	450	Indian ricegrass		25
		Unfavorable	350	galleta		15
				blackbrush		30
				sand dropseed		10
Rock outcrop----	---	Favorable	0			
		Normal	0			
		Unfavorable	0			
516:						
Kaito-----	Stony Slopes (calcareous)	Favorable	500	bottlebrush squirreltail		5
	6-10" p.z.	Normal	350	Indian ricegrass		15
		Unfavorable	200	galleta		5
				Torrey's jointfir		5
				blackbrush		50
				shadscale saltbush		5
Claysprings-----	Clayey Slopes (bouldery)	Favorable	400	bottlebrush squirreltail		5
	6-10" p.z.	Normal	300	Indian ricegrass		10
		Unfavorable	200	galleta		30
				alkali sacaton		10
				bud sagebrush		10
				mound saltbush		5
				shadscale saltbush		15
517:						
Moffat-----	Sandy Loam Upland	Favorable	550	bottlebrush squirreltail		5
	(calcareous) 6-10" p.z.	Normal	450	Cutler's Mormon tea		5
		Unfavorable	350	needleandthread		5
				Indian ricegrass		25
				galleta		10
				blackbrush		30
				sand dropseed		5
518:						
Tohatin-----	Sandy Loam Upland (calcareous)	Favorable	550	Cutler's Mormon tea		5
	6-10" p.z.	Normal	450	Indian ricegrass		25
		Unfavorable	350	galleta		10
				blackbrush		30
				sand dropseed		5
				sandhill muhly		5
Sheppard-----	Sandy Upland 6-10" p.z.	Favorable	700	Cutler's Mormon tea		10
		Normal	500	needleandthread		5
		Unfavorable	300	Indian ricegrass		25
				galleta		10
				blue grama		5
				broom snakeweed		5
				sand dropseed		5
				sandhill muhly		5
				spike dropseed		5

Table 6.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/acre		Pct	Pct
519: Shumbegay-----	Sandy Terrace (sodic) 6-10" p.z.	Favorable	800	bottlebrush squirreltail		5
		Normal	600	Indian ricegrass		5
		Unfavorable	400	Mojave seablite		5
				galleta		5
				alkali sacaton		15
				greasewood		50
				sand dropseed		5
520: Rock outcrop----	---	Favorable	0			
		Normal	0			
		Unfavorable	0			
Needle-----	Sanstone Upland (calcareous) 5-8" p.z.	Favorable	450	needleandthread		5
		Normal	250	Indian ricegrass		15
		Unfavorable	150	galleta		5
				Utah serviceberry		5
				blackbrush		20
				broom snakeweed		5
				muttongrass		5
				sideoats grama		5
				singleleaf ash		5
				wavyleaf oak		20
521: Sandbench-----	Sandy Upland 6-10" p.z.	Favorable	700	Cutler's Mormon tea		5
		Normal	500	needleandthread		10
		Unfavorable	300	Indian ricegrass		25
				galleta		10
				broom snakeweed		5
				sand dropseed		5
				sandhill muhly		5
				spike dropseed		5
				spineless horsebrush		5
Sheppard-----	Sandy Upland 6-10" p.z.	Favorable	700	Cutler's Mormon tea		10
		Normal	500	needleandthread		5
		Unfavorable	300	Indian ricegrass		25
				galleta		10
				blue grama		5
				broom snakeweed		5
				sand dropseed		5
				sandhill muhly		5
				spike dropseed		5
522: Pennell-----	Shallow Sandy Loam (calcareous) 6-10" p.z.	Favorable	450	Cutler's Mormon tea		5
		Normal	350	Indian ricegrass		15
		Unfavorable	250	galleta		10
				blackbrush		55
				broom snakeweed		5
523: Tyende-----	Sandy Loam Upland (sodic) 6-10" p.z.	Favorable	550	Indian ricegrass		20
		Normal	450	galleta		10
		Unfavorable	350	alkali sacaton		40
				broom snakeweed		5

Table 6.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/acre		Pct	Pct
523:						
Aneth-----	Sandy Upland 6-10" p.z.	Favorable	700	Cutler's Mormon tea		5
		Normal	500	needleandthread		10
		Unfavorable	300	Indian ricegrass		30
				galleta		10
				broom snakeweed		5
				sand dropseed		10
				sandhill muhly		5
Shumbegay-----	Sandy Terrace (sodic) 6-10" p.z.	Favorable	800	bottlebrush squirreltail		5
		Normal	600	Indian ricegrass		5
		Unfavorable	400	Mojave seablite		5
				galleta		5
				alkali sacaton		15
				greasewood		50
				sand dropseed		5
524:						
Uzaneva-----	Clay Loam Terrace (sodic) 6-10" p.z.	Favorable	650	bottlebrush squirreltail		5
		Normal	550	Mojave seablite		5
		Unfavorable	450	galleta		10
				alkali sacaton		20
				greasewood		5
				mound saltbush		50
525:						
Rock outcrop----	---	Favorable	0			
		Normal	0			
		Unfavorable	0			
526:						
Sandbench-----	Sandy Upland 6-10" p.z.	Favorable	700	Cutler's Mormon tea		5
		Normal	500	needleandthread		10
		Unfavorable	300	Indian ricegrass		25
				galleta		10
				broom snakeweed		5
				sand dropseed		5
				sandhill muhly		5
				spike dropseed		5
				spineless horsebrush		5
Rock outcrop----	---	Favorable	0			
		Normal	0			
		Unfavorable	0			
Piute, cool-----	Sandstone Upland 6-10" p.z.	Favorable	450	Bigelow's sagebrush		10
		Normal	350	Eastwood's sandwort		5
		Unfavorable	250	needleandthread		10
				Indian ricegrass		20
				galleta		15
				black grama		10
				blue grama		5
				broom snakeweed		5
				narrowleaf yucca		5
527:						
Outpost-----	Clay Fan 6-10" p.z.	Favorable	650	bottlebrush squirreltail		10
		Normal	550	Indian ricegrass		5
		Unfavorable	400	galleta		20
				alkali sacaton		30
				fourwing saltbush		10

Table 6.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/acre		Pct	Pct
528:						
Mack-----	Loamy Upland 6-10" p.z.	Favorable	700	bottlebrush squirreltail		10
		Normal	500	Greene's rabbitbrush		5
		Unfavorable	300	Indian ricegrass		10
				galleta		25
				blue grama		10
				sand dropseed		5
				winterfat		5
600:						
Kunz-----	---	Favorable	---	bottlebrush squirreltail	10	
		Normal	---	Gambel's oak	20	
		Unfavorable	---	Rocky Mountain juniper	5	
				blue grama	20	
				pingue hymenoxys	5	
				prairie junegrass	5	
				silvery lupine	5	
				twoneedle pinyon	5	
				unknown	5	
Yahmore-----	---	Favorable	---	bottlebrush squirreltail	10	
		Normal	---	Gambel's oak	10	
		Unfavorable	---	needleandthread	10	
				Rocky Mountain juniper	5	
				blue grama	15	
				mountain big sagebrush	5	
				pingue hymenoxys	5	
				silvery lupine	5	
				twoneedle pinyon	5	
602:						
Bostwick-----	Loamy Upland 18-22" p.z.	Favorable	1400	bottlebrush squirreltail		10
		Normal	1200	Gambel's oak		5
		Unfavorable	1000	Wyoming big sagebrush		15
				blue grama		10
				sand dropseed		5
				silvery lupine		5
				western wheatgrass		25
Canburn-----	Meadow 18-22" p.z.	Favorable	3500	Baltic rush		15
		Normal	3000	Rocky Mountain iris		5
		Unfavorable	2500	Woods' rose		5
				tufted hairgrass		10
				western wheatgrass		5
				willow		5
604:						
Yahmore-----	---	Favorable	---	bottlebrush squirreltail	10	
		Normal	---	Gambel's oak	10	
		Unfavorable	---	needleandthread	10	
				Rocky Mountain juniper	5	
				blue grama	15	
				mountain big sagebrush	5	
				pingue hymenoxys	5	
				silvery lupine	5	
				twoneedle pinyon	5	

Table 6.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/acre		Pct	Pct
604: Sandark-----	---	Favorable	---	bottlebrush squirreltail	5	
		Normal	---	Gambel's oak	45	
		Unfavorable	---	mountain brome	5	
				nodding brome	10	
				silvery lupine	5	
606: Narbona-----	---	Favorable	---	bottlebrush squirreltail	5	
		Normal	---	Gambel's oak	20	
		Unfavorable	---	Oregongrape	5	
				Woods' rose	5	
				nodding brome	10	
				prairie junegrass	5	
				silvery lupine	5	
Deza-----	---	Favorable	---	bottlebrush squirreltail	10	
		Normal	---	Gambel's oak	5	
		Unfavorable	---	Oregongrape	5	
				hairy brackenfern	15	
				nodding brome	5	
				silvery lupine	20	
608: Narbona-----	---	Favorable	---	bottlebrush squirreltail	5	
		Normal	---	Gambel's oak	20	
		Unfavorable	---	Oregongrape	5	
				Woods' rose	5	
				nodding brome	10	
				prairie junegrass	5	
				silvery lupine	5	
Zilditloi-----	---	Favorable	---	muttongrass	20	
		Normal	---	Indian ricegrass	15	
		Unfavorable	---	bottlebrush squirreltail	5	
				Utah serviceberry	5	
				antelope bitterbrush	10	
				Bailey yucca	5	
				hairy goldaster	5	
610: Kunz-----	---	Favorable	---			
		Normal	---			
		Unfavorable	---			
Xankey-----	---	Favorable	---	bottlebrush squirreltail	5	
		Normal	---	Gambel's oak	40	
		Unfavorable	---	Oregongrape	5	
				muttongrass	5	
				pingue hymenoxys	5	
				thrifty goldenweed	5	
				twoneedle pinyon	5	
612: Xankey-----	---	Favorable	---	bottlebrush squirreltail	5	
		Normal	---	Gambel's oak	40	
		Unfavorable	---	Oregongrape	5	
				muttongrass	5	
				pingue hymenoxys	5	
				thrifty goldenweed	5	
				twoneedle pinyon	5	

Table 6.--Rangeland Productivity and Characteristic Plant Communities-Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/acre		Pct	Pct
614: Kunz-----	---	Favorable	---	bottlebrush squirreltail	5	
		Normal	---	Gambel's oak	50	
		Unfavorable	---	Oregongrape	5	
				mountain muhly	5	
				muttongrass	5	
Tuntsa-----	Loamy Upland 18-22" p.z.	Favorable	1500	black sagebrush		10
		Normal	1350	bottlebrush squirreltail		5
		Unfavorable	1200	blue grama		15
				pingue hymenoxys		5
				silvery lupine		5
				western wheatgrass		10
Yahmore-----	---	Favorable	---	bottlebrush squirreltail	10	
		Normal	---	Gambel's oak	10	
		Unfavorable	---	needleandthread	10	
				Rocky Mountain juniper	5	
				blue grama	15	
				mountain big sagebrush	5	
				pingue hymenoxys	5	
				silvery lupine	5	
				twoneedle pinyon	5	
616: Ligai-----	---	Favorable	---	bottlebrush squirreltail	5	
		Normal	---	Gambel's oak	10	
		Unfavorable	---	Utah serviceberry	20	
				cliff fendlerbush	5	
				muttongrass	20	
				whortleleaf snowberry	5	
Pastorpeak-----	---	Favorable	---	Gambel's oak	10	
		Normal	---	Utah serviceberry	10	
		Unfavorable	---	littleleaf mockoRange	5	
				nodding brome	5	
				rockspirea	5	
				western chokecherry	10	
				whortleleaf snowberry	40	
Rock outcrop----	---	Favorable	---			
		Normal	---			
		Unfavorable	---			
618: Zibetod-----	Sandstone Upland (cobbly) 17-20" p.z.	Favorable	1100	black sagebrush		20
		Normal	900	bottlebrush squirreltail		10
		Unfavorable	700	Gambel's oak		5
				groundsel		5
				hairy goldenaster		5
				muttongrass		15
				ponderosa pine		5
				trailing fleabane		5
				twoneedle pinyon		5

Table 6.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/acre		Pct	Pct
618: Bigpaw-----	Silty Upland 17-20" p.z.	Favorable	1500	Arizona fescue		10
		Normal	1300	black sagebrush		20
		Unfavorable	1100	bottlebrush squirreltail		10
				Gambel's oak		5
				common chokecherry		5
				groundsel		5
				muttongrass		10
				trailing fleabane		5
				western wheatgrass		20
700: Akhoni-----	---	Favorable	---	bottlebrush squirreltail	5	
		Normal	---	Gambel's oak	5	
		Unfavorable	---	Kentucky bluegrass	25	
				fleabane	5	
				mountain muhly	5	
				pussytoes	5	
				western yarrow	5	
				woodland strawberry	5	
Retaw-----	Wetland	Favorable	---	common marestalk		5
		Normal	2000	floating pondweed		20
		Unfavorable	---	needle spikerush		15
				northern manna grass		50
702: Bikeyah-----	Meadow 18-22" p.z.	Favorable	3500	clover		5
		Normal	3000	redtop		10
		Unfavorable	2500	sedge		10
				silverweed cinquefoil		5
				timothy		5
				western wheatgrass		5
				western yarrow		5
Berland-----	Shallow Loamy 18-22" p.z.	Favorable	1200	Arizona fescue		10
		Normal	1000	Louisiana sagewort		5
		Unfavorable	800	blue grama		10
				mountain muhly		15
				pond waterstarwort		10
				prairie junegrass		5
				pussytoes		10
				silverweed cinquefoil		5
704: Klizehin-----	---	Favorable	---	Kentucky bluegrass	15	
		Normal	---	Oregongrape	5	
		Unfavorable	---	common juniper	5	
				kinnikinnick	5	
				pussytoes	5	
				rose	5	
Captom-----	---	Favorable	---	bottlebrush squirreltail	10	
		Normal	---	Gambel's oak	20	
		Unfavorable	---	Kentucky bluegrass	15	
				Oregongrape	10	
				nodding brome	5	

Table 6.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/acre		Pct	Pct
706:						
Todacheene-----	Loamy Upland 18-22" p.z.	Favorable	1500	Arizona fescue		25
		Normal	1350	bottlebrush squirreltail		10
		Unfavorable	1200	blue grama		10
				needleleaf sedge		15
				pingue hymenoxys		5
				pussytoes		5
				silvery lupine		5
Viewpoint-----	---	Favorable	---	bottlebrush squirreltail	5	
		Normal	---	Gambel's oak	5	
		Unfavorable	---	Kentucky bluegrass	25	
				Oregongrape	5	
				pingue hymenoxys	5	
Owlspring-----	Meadow 18-22" p.z.	Favorable	3500	Baltic rush		15
		Normal	3000	Rocky Mountain iris		10
		Unfavorable	2500	needleleaf sedge		5
				pussytoes		5
				redtop		15
				slender wheatgrass		5
				tufted hairgrass		15
				western yarrow		5
708:						
Tunitcha-----	---	Favorable	---	bottlebrush squirreltail	5	
		Normal	---	Gambel's oak	50	
		Unfavorable	---	Oregongrape	5	
				nodding brome	5	
				silvery lupine	5	
Bangston-----	---	Favorable	---	Gambel's oak	10	
		Normal	---	Kentucky bluegrass	10	
		Unfavorable	---	Oregongrape	5	
				Rocky Mountain maple	5	
				nodding brome	5	
				whortleleaf snowberry	30	
710:						
Akhoni-----	---	Favorable	---	bottlebrush squirreltail	5	
		Normal	---	Gambel's oak	10	
		Unfavorable	---	Kentucky bluegrass	10	
				hairy brackenfern	5	
				kinnikinnick	5	
				mountain muhly	5	
				pussytoes	5	
				whortleleaf snowberry	5	
Klizhin-----	---	Favorable	---	bottlebrush squirreltail	5	
		Normal	---	Gambel's oak	10	
		Unfavorable	---	Kentucky bluegrass	10	
				Oregongrape	5	
				Ross' sedge	5	
				hairy brackenfern	10	
				kinnikinnick	5	
				pingue hymenoxys	5	
				pussytoes	5	
				whortleleaf snowberry	5	

Table 6.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Range site	Total production		Characteristic vegetation	Composition	
		Kind of year	Dry weight		Forest	Range
			Lb/acre		Pct	Pct
712: Sonsela-----	---	Favorable	---	Arizona fescue	5	
		Normal	---	bottlebrush squirreltail	10	
		Unfavorable	---	Gambel's oak	10	
				Kentucky bluegrass	5	
				Oregongrape	5	
				muttongrass	25	
				nodding brome	5	
				whortleleaf snowberry	5	
Washpass-----	---	Favorable	---	Arizona fescue	5	
		Normal	---	Fendler's meadowrue	5	
		Unfavorable	---	Kentucky bluegrass	15	
				Oregongrape	5	
				silvery lupine	5	
				whortleleaf snowberry	15	
				woodland strawberry	5	
Viewpoint-----	---	Favorable	---	Arizona fescue	10	
		Normal	---	bottlebrush squirreltail	10	
		Unfavorable	---	Gambel's oak	5	
				Oregongrape	5	
				mountain muhly	5	
				pingue hymenoxys	5	
				prairie junegrass	10	
				whortleleaf snowberry	5	
W: Water		---	---	---		

Table 7.--Woodland Management and Productivity

Map symbol and soil name	Potential productivity			Trees to manage
	Common trees	Site index	Volume of wood fiber cu ft/ac	
300:				
Farview-----	Utah juniper (woodland)----- twoneedle pinyon----	20	14	---
Rock outcrop-----	---	---	---	---
301:				
Farview-----	Utah juniper (woodland)----- twoneedle pinyon----	20	14	---
Sanostee-----	---	---	---	---
Rock outcrop-----	---	---	---	---
302:				
Doakum-----	---	---	---	---
303:				
Snapill-----	---	---	---	---
304:				
Farview-----	Utah juniper (woodland)----- twoneedle pinyon----	20	14	---
Beclabito-----	---	---	---	---
Rock outcrop-----	---	---	---	---
308:				
Mcelmo-----	---	---	---	---
Farview-----	Utah juniper (woodland)----- twoneedle pinyon----	20	14	---
309:				
Rock outcrop-----	---	---	---	---
Rizno-----	Utah juniper (woodland)----- twoneedle pinyon----	20	---	---
400:				
Wetherill-----	Utah juniper (woodland)----- twoneedle pinyon----	65	29	twoneedle pinyon
Atlatl-----	Utah juniper (woodland)----- twoneedle pinyon----	53	29	twoneedle pinyon

Table 7.--Woodland Management and Productivity--Continued

Map symbol and soil name	Potential productivity			Trees to manage
	Common trees	Site index	Volume of wood fiber cu ft/ac	
401: Vessilla-----	Utah juniper (woodland)----- twoneedle pinyon----	80 ---	29 ---	---
Rock outcrop-----	---	---	---	---
402: Chazner-----	Utah juniper (woodland)----- twoneedle pinyon----	65 ---	29 ---	twoneedle pinyon
403: Chazner-----	Utah juniper (woodland)----- twoneedle pinyon----	65 ---	29 ---	twoneedle pinyon
Katzine-----	Utah juniper (woodland)----- twoneedle pinyon----	60 ---	---	twoneedle pinyon
404: Wetherill-----	Utah juniper (woodland)----- twoneedle pinyon----	65 ---	29 ---	twoneedle pinyon
Tsezhin-----	Utah juniper (woodland)----- twoneedle pinyon----	---	---	twoneedle pinyon
406: Rock outcrop-----	---	---	---	---
Nizhoni-----	Utah juniper (woodland)----- twoneedle pinyon----	---	---	---
		43	14	
407: Iwela-----	Utah juniper (woodland)----- twoneedle pinyon----	---	---	Utah juniper (woodland), twoneedle pinyon
		55	29	
Nomrah-----	Utah juniper (woodland)----- twoneedle pinyon----	---	---	Utah juniper (woodland), twoneedle pinyon
		70	29	
Vosburg-----	---	---	---	---
408: Nizhoni-----	Utah juniper (woodland)----- twoneedle pinyon----	---	---	---
		65	29	
Rock outcrop-----	---	---	---	---

Table 7.--Woodland Management and Productivity--Continued

Map symbol and soil name	Potential productivity			Trees to manage
	Common trees	Site index	Volume of wood fiber cu ft/ac	
409: Chinlini-----	---	---	---	---
410: Wetherill-----	Utah juniper (woodland)----- twoneedle pinyon----	80 ---	29 ---	---
411: Sojourn-----	Utah juniper (woodland)----- twoneedle pinyon----	---	29	---
Badland-----	---	---	---	---
412: Highdye-----	Utah juniper (woodland)----- twoneedle pinyon----	---	14	Utah juniper (woodland), twoneedle pinyon
Menefee-----	Utah juniper (woodland)----- twoneedle pinyon----	60 ---	---	Utah juniper (woodland), twoneedle pinyon
413: Hozho-----	Utah juniper (woodland)----- twoneedle pinyon----	---	35	Utah juniper (woodland), twoneedle pinyon
Quezcan-----	Utah juniper (woodland)----- twoneedle pinyon----	---	45	Utah juniper (woodland), twoneedle pinyon
Rock outcrop-----	---	---	---	---
414: Arabrab-----	Utah juniper (woodland)----- twoneedle pinyon----	---	14	Utah juniper (woodland), twoneedle pinyon
Wetherill-----	Utah juniper (woodland)----- twoneedle pinyon----	---	14	Utah juniper (woodland), twoneedle pinyon
415: Tsezhin-----	Utah juniper (woodland)----- twoneedle pinyon----	---	29	Utah juniper (woodland), twoneedle pinyon
416: Arabrab-----	Utah juniper (woodland)----- twoneedle pinyon----	---	14	Utah juniper (woodland), twoneedle pinyon
Rock outcrop-----	---	---	---	---

Table 7.--Woodland Management and Productivity--Continued

Map symbol and soil name	Potential productivity			Trees to manage
	Common trees	Site index	Volume of wood fiber cu ft/ac	
417: Wetherill-----	Utah juniper (woodland)----- twoneedle pinyon----	--- 105	--- 43	twoneedle pinyon
418: Menefee-----	Utah juniper (woodland)----- twoneedle pinyon----	--- 60	--- ---	Utah juniper (woodland), twoneedle pinyon
Espiritu-----	Utah juniper (woodland)----- twoneedle pinyon----	--- 65	--- ---	Utah juniper (woodland), twoneedle pinyon
Rock outcrop-----	---	---	---	---
600: Kunz-----	ponderosa pine-----	58	43	ponderosa pine
Yahmore-----	ponderosa pine-----	60	43	ponderosa pine
602: Bostwick-----	---	---	---	---
Canburn-----	---	---	---	---
604: Yahmore-----	ponderosa pine-----	62	43	ponderosa pine
Sandark-----	ponderosa pine-----	85	72	ponderosa pine
606: Narbona-----	Douglas fir(woodland)----- ponderosa pine----- quaking aspen-----	65 72 79	43 57 43	ponderosa pine
Deza-----	Douglas fir(woodland)----- ponderosa pine----- quaking aspen-----	65 84 87	43 72 57	ponderosa pine
608: Narbona-----	Douglas fir(woodland)----- ponderosa pine----- quaking aspen-----	65 72 79	43 57 43	Douglas fir(woodland), ponderosa pine
Zilditloi-----	ponderosa pine pinyon	70 70	72 0	Ponderosa pine
610: Kunz-----	ponderosa pine-----	80	72	ponderosa pine
Xankey-----	ponderosa pine-----	73	57	ponderosa pine

Table 7.--Woodland Management and Productivity--Continued

Map symbol and soil name	Potential productivity			Trees to manage
	Common trees	Site index	Volume of wood fiber cu ft/ac	
612: Xankey-----	Douglas fir(woodland)----- ponderosa pine-----	65 73	43 57	ponderosa pine
614: Kunz-----	ponderosa pine-----	70	57	ponderosa pine
Tuntsa-----	---	---	---	---
Yahmore-----	ponderosa pine-----	75	57	ponderosa pine
616: Ligai-----	twoneedle pinyon---	70	---	twoneedle pinyon
Pastorpeak-----	Douglas fir(woodland)-----	55	29	Douglas fir(woodland)
Rock outcrop-----	---	---	---	---
618: Zibetod-----	---	---	---	---
Bigpaw-----	---	---	---	---
700: Akhoni-----	ponderosa pine-----	80	72	ponderosa pine
Retaw-----	---	---	---	---
702: Bikeyah-----	---	---	---	---
Berland-----	---	---	---	---
704: Klizhin-----	Douglas fir(woodland)----- ponderosa pine----- quaking aspen-----	71 83 62	43 72 29	ponderosa pine
Captom-----	ponderosa pine-----	82	72	ponderosa pine
706: Todacheene-----	---	---	---	---
Viewpoint-----	ponderosa pine-----	80	72	ponderosa pine
Owlspring-----	---	---	---	---

Table 7.--Woodland Management and Productivity--Continued

Map symbol and soil name	Potential productivity			Trees to manage
	Common trees	Site index	Volume of wood fiber cu ft/ac	
708:				
Tunitcha-----	Douglas	71	43	ponderosa pine
	fir(woodland)-----			
	ponderosa pine-----	82	72	
	quaking aspen-----	79	43	
Bangston-----	Douglas	71	43	ponderosa pine,
	fir(woodland)-----			ponderosa pine,
	corkbark fir-----	84	86	ponderosa pine
	ponderosa pine-----	79	72	
	quaking aspen-----	79	43	
710:				
Akhoni-----	Douglas	71	43	ponderosa pine
	fir(woodland)-----			
	ponderosa pine-----	80	72	
	quaking aspen-----	79	43	
Klizhin-----	Douglas	75	57	ponderosa pine
	fir(woodland)-----			
	corkbark fir-----	84	86	
	ponderosa pine-----	84	72	
	quaking aspen-----	79	43	
712:				
Sonsela-----	Douglas	71	43	Douglas
	fir(woodland)-----			fir(woodland),
	ponderosa pine-----	75	57	ponderosa pine
Washpass-----	Douglas	75	57	Douglas
	fir(woodland)-----			fir(woodland)
	corkbark fir-----	75	72	
	quaking aspen-----	62	29	
Viewpoint-----	Douglas	71	43	ponderosa pine
	fir(woodland)-----			
	ponderosa pine-----	80	72	
W:				
Water-----	---	---	---	---

Table 8.--Recreational Development

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable.)

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
100: Werito-----	Severe: excess sodium	Severe: excess sodium	Severe: excess sodium	Moderate: dusty	Severe: excess sodium
102: Blackston-----	Moderate: small stones	Moderate: small stones	Severe: small stones	Slight	Moderate: large stones small stones droughty
Camac-----	Severe: large stones slope small stones	Severe: large stones slope small stones	Severe: large stones slope small stones	Severe: slope	Severe: large stones slope small stones
Rock outcrop-----	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Slight	Severe: depth to rock
105: Hamburn-----	Severe: flooding	Severe: excess sodium	Severe: excess sodium flooding	Moderate: flooding	Severe: excess sodium flooding
107: Tocito-----	Severe: flooding	Moderate: dusty	Moderate: dusty slope	Moderate: dusty	Slight
Gullied land-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope
110: Brimhall-----	Slight	Slight	Moderate: slope	Slight	Slight
Benally-----	Severe: excess sodium	Severe: excess sodium	Severe: excess sodium	Slight	Severe: excess sodium
Genats-----	Severe: excess sodium slope	Severe: excess sodium slope	Severe: excess sodium slope small stones	Severe: slope	Severe: excess sodium slope
113: Gyptur-----	Severe: excess sodium	Severe: excess sodium	Severe: excess sodium	Moderate: dusty	Severe: excess sodium
115: Denazar-----	Severe: too sandy	Severe: too sandy	Severe: too sandy	Severe: too sandy	Moderate: droughty
Farb-----	Severe: too sandy depth to rock	Severe: too sandy depth to rock	Severe: depth to rock	Severe: too sandy	Severe: depth to rock

Table 8.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
117: Badland-----	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Slight	Severe: depth to rock
Rock outcrop-----	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Slight	Severe: depth to rock
120: Nageezi-----	Slight	Slight	Moderate: slope	Slight	Slight
Denazar-----	Severe: too sandy	Severe: too sandy	Severe: too sandy	Severe: too sandy	Moderate: droughty
122: Blueflat-----	Severe: excess sodium	Severe: excess sodium	Severe: excess sodium slope	Moderate: dusty	Severe: excess sodium
Notal-----	Severe: excess sodium flooding	Severe: excess sodium	Severe: excess sodium	Slight	Severe: excess sodium
125: Kimbeto-----	Severe: excess sodium	Severe: excess sodium	Severe: excess sodium	Slight	Severe: excess sodium
130: Badland-----	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Slight	Severe: depth to rock
Genats-----	Severe: excess sodium slope	Severe: excess sodium slope	Severe: excess sodium slope small stones	Severe: slope	Severe: excess sodium slope
133: Razito-----	Severe: too sandy	Severe: too sandy	Severe: too sandy	Severe: too sandy	Severe: droughty
135: Farb-----	Severe: depth to rock	Severe: depth to rock	Severe: slope small stones depth to rock	Slight	Severe: depth to rock
Rock outcrop-----	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Slight	Severe: depth to rock
Badland-----	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Slight	Severe: depth to rock
137: Persayo-----	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: erodes easily	Severe: depth to rock

Table 8.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
137: Cairn-----	Moderate: small stones	Moderate: small stones	Severe: small stones	Slight	Moderate: large stones small stones droughty
Patel-----	Severe: excess sodium slope small stones	Severe: excess sodium slope small stones	Severe: excess sodium slope small stones	Moderate: dusty slope	Severe: excess sodium slope small stones
140: Benally-----	Severe: excess sodium flooding	Severe: excess sodium	Severe: excess sodium	Slight	Severe: excess sodium
142: Bebeever-----	Severe: flooding	Slight	Moderate: flooding	Slight	Severe: droughty
Walrees-----	Severe: flooding	Moderate: excess salt flooding wetness	Severe: flooding	Moderate: flooding	Severe: flooding
145: Razito-----	Moderate: too sandy	Moderate: too sandy	Moderate: slope too sandy	Moderate: too sandy	Moderate: droughty
Huerfano-----	Severe: excess sodium depth to rock	Severe: excess sodium depth to rock	Severe: excess sodium depth to rock	Slight	Severe: excess sodium depth to rock
147: Escavada-----	Severe: flooding too sandy	Severe: too sandy	Severe: too sandy	Severe: too sandy	Severe: droughty
150: Chipeta-----	Severe: excess sodium slope depth to rock	Severe: excess sodium excess salt slope	Severe: excess sodium slope depth to rock	Severe: erodes easily	Severe: excess sodium excess salt slope
Badland-----	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Slight	Severe: depth to rock
Moncisco-----	Severe: large stones slope small stones	Severe: large stones slope small stones	Severe: large stones slope small stones	Severe: slope small stones	Severe: slope small stones droughty
153: Green River-----	Severe: flooding	Slight	Slight	Slight	Slight
Green River, saline----	Severe: flooding	Slight	Slight	Slight	Moderate: droughty

Table 8.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
155: Mesa-----	Slight	Slight	Moderate: slope small stones	Slight	Slight
157: Werjo, saline-----	Severe: excess sodium flooding	Severe: excess sodium	Severe: excess sodium	Slight	Severe: excess sodium droughty
Werjo-----	Severe: flooding	Slight	Slight	Slight	Slight
160: Notal-----	Severe: excess sodium flooding	Severe: excess sodium	Severe: excess sodium	Slight	Severe: excess sodium
Escavada-----	Severe: flooding	Moderate: dusty	Moderate: dusty flooding	Moderate: dusty	Moderate: flooding droughty
Riverwash-----	Severe: flooding too sandy wetness	Severe: too sandy wetness	Severe: flooding too sandy wetness	Severe: too sandy wetness	Severe: flooding wetness droughty
163: Werlog-----	Severe: excess sodium excess salt flooding	Severe: excess sodium excess salt	Severe: excess sodium excess salt	Slight	Severe: excess sodium excess salt
165: Jeddito-----	Severe: excess sodium flooding	Severe: excess sodium	Severe: excess sodium	Slight	Severe: excess sodium
Escavada-----	Severe: flooding	Moderate: dusty	Moderate: dusty flooding	Moderate: dusty	Moderate: flooding droughty
167: Hoskay-----	Severe: excess sodium	Severe: excess sodium	Severe: excess sodium small stones	Moderate: dusty	Severe: excess sodium
Patel-----	Severe: excess sodium small stones	Severe: excess sodium slope	Severe: excess sodium slope small stones	Moderate: slope	Severe: excess sodium slope
Badland-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Moderate: slope	Severe: slope depth to rock
170: Notal-----	Severe: excess sodium flooding	Severe: excess sodium	Severe: excess sodium	Slight	Severe: excess sodium
173: Shiprock-----	Slight	Slight	Moderate: slope	Slight	Slight

Table 8.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
175: Suwanee-----	Severe: flooding	Moderate: dusty	Moderate: dusty flooding	Moderate: dusty	Moderate: flooding
177: Notal-----	Severe: excess sodium	Severe: excess sodium	Severe: excess sodium	Slight	Severe: excess sodium
180: Kimbeto-----	Severe: excess sodium	Severe: excess sodium	Severe: excess sodium	Slight	Severe: excess sodium
Huerfano-----	Severe: excess sodium depth to rock	Severe: excess sodium depth to rock	Severe: excess sodium depth to rock	Slight	Severe: excess sodium depth to rock
183: Gyptur-----	Severe: excess sodium	Severe: excess sodium	Severe: excess sodium slope	Severe: erodes easily	Severe: excess sodium
190: Jeddito-----	Severe: flooding	Slight	Slight	Slight	Moderate: droughty
195: Tewa-----	Moderate: slope	Moderate: slope	Severe: slope	Slight	Moderate: slope
200: Tocito-----	Moderate: dusty	Moderate: dusty	Moderate: dusty slope	Moderate: dusty	Slight
205: Shiprock-----	Slight	Slight	Moderate: slope	Slight	Slight
Farb-----	Severe: too sandy depth to rock	Severe: too sandy depth to rock	Severe: depth to rock	Severe: too sandy	Severe: depth to rock
210: Mack-----	Slight	Slight	Moderate: slope	Slight	Slight
Mesa-----	Slight	Slight	Moderate: slope small stones	Slight	Slight
215: Persayo-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: erodes easily	Severe: depth to rock
Fordbutte-----	Severe: excess sodium	Severe: excess sodium	Severe: excess sodium	Moderate: dusty	Severe: excess sodium
220: Chinde-----	Severe: excess sodium	Severe: excess sodium	Severe: excess sodium	Moderate: dusty	Severe: excess sodium

Table 8.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
230: Ravola-----	Severe: flooding	Moderate: dusty	Moderate: dusty flooding slope	Moderate: dusty	Moderate: flooding
235: Wingrock-----	Moderate: slope small stones	Moderate: slope small stones	Severe: slope small stones	Slight	Moderate: slope small stones droughty
Rock outcrop-----	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Slight	Severe: depth to rock
240: Nageezi-----	Slight	Slight	Moderate: slope	Slight	Slight
245: Tsebitai-----	Moderate: dusty	Moderate: dusty	Moderate: dusty slope	Moderate: dusty	Slight
250: Littlehat-----	Severe: excess sodium excess salt	Severe: excess sodium excess salt	Severe: excess sodium excess salt slope	Severe: erodes easily	Severe: excess sodium excess salt droughty
Persayo-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: erodes easily	Severe: depth to rock
Nataani-----	Moderate: dusty	Moderate: dusty	Moderate: dusty slope depth to rock	Moderate: dusty	Moderate: depth to rock
255: Benally-----	Severe: excess sodium	Severe: excess sodium	Severe: excess sodium	Slight	Severe: excess sodium
260: Littlehat-----	Severe: excess sodium excess salt slope	Severe: excess sodium excess salt slope	Severe: excess sodium excess salt slope	Severe: erodes easily	Severe: excess sodium excess salt slope
Persayo-----	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: erodes easily	Severe: depth to rock
Badland-----	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Slight	Severe: depth to rock
265: Camac-----	Severe: large stones slope small stones	Severe: large stones slope small stones	Severe: large stones slope small stones	Severe: slope	Severe: large stones slope small stones

Table 8.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
265: Kimbeto-----	Severe: excess sodium	Severe: excess sodium	Severe: excess sodium	Slight	Severe: excess sodium
Badland-----	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Slight	Severe: depth to rock
270: Fruitland-----	Slight	Slight	Moderate: slope	Slight	Slight
275: Razito-----	Moderate: too sandy	Moderate: too sandy	Moderate: slope too sandy	Moderate: too sandy	Moderate: droughty
285: Water-----	---	---	---	---	---
Riverwash-----	Severe: flooding small stones wetness	Severe: small stones too sandy wetness	Severe: small stones too sandy wetness	Severe: small stones too sandy wetness	Severe: small stones wetness droughty
290: Mesa-----	Slight	Slight	Slight	Slight	Slight
295: Mesa-----	Slight	Slight	Slight	Slight	Slight
300: Farview-----	Severe: depth to rock	Severe: depth to rock	Severe: small stones depth to rock	Slight	Severe: depth to rock
Rock outcrop-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Moderate: slope	Severe: slope depth to rock
301: Farview-----	Severe: depth to rock	Severe: depth to rock	Severe: small stones depth to rock	Slight	Severe: depth to rock
Sanostee-----	Slight	Slight	Moderate: slope depth to rock	Slight	Moderate: depth to rock droughty
Rock outcrop-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Moderate: slope	Severe: slope depth to rock
302: Doakum-----	Slight	Slight	Moderate: slope	Slight	Slight
303: Snapill-----	Severe: excess sodium	Severe: excess sodium	Severe: excess sodium	Moderate: dusty	Severe: excess sodium

Table 8.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
304:					
Farview-----	Severe: depth to rock	Severe: depth to rock	Severe: small stones depth to rock	Slight	Severe: depth to rock
Beclabito-----	Severe: excess sodium	Severe: excess sodium	Severe: excess sodium	Slight	Severe: excess sodium
Rock outcrop-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Moderate: slope	Severe: slope depth to rock
305:					
Strych-----	Severe: large stones slope small stones	Severe: large stones slope small stones	Severe: large stones slope small stones	Severe: slope small stones	Severe: large stones slope small stones
Eagleeye-----	Severe: slope small stones depth to rock	Severe: slope small stones depth to rock	Severe: slope small stones depth to rock	Severe: slope	Severe: slope small stones depth to rock
Rock outcrop-----	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Slight	Severe: depth to rock
306:					
Arches-----	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Moderate: too sandy	Severe: depth to rock
Kitsili-----	Slight	Slight	Moderate: slope	Slight	Slight
Mido-----	Moderate: too sandy	Moderate: too sandy	Severe: slope	Moderate: too sandy	Moderate: droughty
307:					
Bodot-----	Severe: large stones slope small stones	Severe: large stones slope small stones	Severe: large stones slope small stones	Severe: slope small stones	Severe: large stones slope small stones
Beclabito-----	Severe: excess sodium large stones slope	Severe: excess sodium large stones slope	Severe: large stones slope small stones	Severe: slope	Severe: excess sodium large stones slope
Rock outcrop-----	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Slight	Severe: depth to rock
308:					
Mcelmo-----	Severe: excess sodium small stones	Severe: excess sodium small stones	Severe: excess sodium slope small stones	Severe: small stones	Severe: excess sodium small stones
Farview-----	Severe: fragile depth to rock	Severe: fragile depth to rock	Severe: slope fragile depth to rock	Severe: fragile	Severe: depth to rock

Table 8.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
309: Rock outcrop-----	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Slight	Severe: depth to rock
Rizno-----	Severe: fragile depth to rock	Severe: fragile depth to rock	Severe: slope fragile depth to rock	Severe: fragile	Severe: depth to rock
310: Millett-----	Moderate: small stones	Moderate: small stones	Severe: small stones	Slight	Moderate: small stones droughty
Blanding-----	Moderate: dusty	Moderate: dusty	Moderate: dusty slope	Moderate: dusty	Slight
Strych-----	Severe: large stones slope small stones	Severe: large stones slope small stones	Severe: large stones slope small stones	Severe: slope	Severe: large stones small stones droughty
311: Kinusta-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope small stones depth to rock	Severe: slope	Severe: slope depth to rock
Eslando-----	Severe: slope small stones depth to rock	Severe: slope small stones depth to rock	Severe: slope small stones depth to rock	Severe: slope	Severe: slope small stones depth to rock
Rock outcrop-----	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Slight	Severe: depth to rock
312: Blanding-----	Moderate: dusty	Moderate: dusty	Moderate: dusty slope	Moderate: dusty	Slight
313: Marjane-----	Slight	Slight	Moderate: slope depth to rock	Slight	Moderate: depth to rock
Kitsili-----	Slight	Slight	Moderate: slope	Slight	Slight
314: Mido-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope
315: Shoegame-----	Severe: flooding large stones	Severe: large stones	Severe: large stones small stones	Moderate: large stones	Severe: large stones droughty

Table 8.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
315: Riverwash-----	Severe: flooding large stones small stones	Severe: large stones small stones too sandy	Severe: large stones small stones too sandy	Severe: too sandy	Severe: flooding small stones droughty
316: Millett-----	Severe: large stones slope	Severe: large stones slope	Severe: large stones slope small stones	Moderate: large stones slope	Severe: large stones slope
Strych-----	Severe: large stones slope small stones	Severe: large stones slope small stones	Severe: large stones slope small stones	Severe: slope small stones	Severe: large stones slope small stones
Doakum-----	Moderate: slope	Moderate: slope	Severe: slope	Slight	Moderate: slope
317: Toadlena-----	Severe: depth to rock	Severe: depth to rock	Severe: slope small stones depth to rock	Moderate: dusty	Severe: depth to rock
Eagleye-----	Severe: slope small stones depth to rock	Severe: slope small stones depth to rock	Severe: slope small stones depth to rock	Severe: slope	Severe: slope small stones depth to rock
318: Camino-----	Severe: excess sodium	Severe: excess sodium	Severe: excess sodium	Slight	Severe: excess sodium
319: Skyhawk-----	Severe: slope small stones	Severe: slope small stones	Severe: slope small stones	Severe: slope small stones	Severe: slope small stones
Lavellga-----	Severe: small stones	Severe: small stones	Severe: slope small stones	Slight	Severe: excess lime small stones droughty
320: Beclabito-----	Severe: excess sodium	Severe: excess sodium	Severe: excess sodium slope	Severe: erodes easily	Severe: excess sodium
Kinusta-----	Severe: slope small stones depth to rock	Severe: slope small stones depth to rock	Severe: slope small stones depth to rock	Severe: slope	Severe: slope small stones depth to rock
Badland-----	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Slight	Severe: depth to rock
400: Wetherill-----	Moderate: dusty slope	Moderate: dusty slope	Severe: slope	Severe: erodes easily	Moderate: slope

Table 8.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
400: Atlatl-----	Severe: fragile	Severe: fragile	Severe: slope small stones fragile	Slight	Moderate: small stones depth to rock
401: Vessilla-----	Severe: slope fragile depth to rock	Severe: slope fragile depth to rock	Severe: slope fragile depth to rock	Severe: fragile	Severe: slope depth to rock
Rock outcrop-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Moderate: slope	Severe: slope depth to rock
402: Chazner-----	Severe: large stones	Severe: large stones	Severe: large stones slope small stones	Moderate: large stones	Severe: large stones
403: Chazner-----	Moderate: small stones	Moderate: small stones	Severe: slope small stones	Slight	Moderate: large stones small stones droughty
Katzine-----	Severe: large stones slope	Severe: large stones slope	Severe: large stones slope small stones	Severe: slope	Severe: large stones slope
404: Wetherill-----	Moderate: dusty	Moderate: dusty	Moderate: dusty slope	Severe: erodes easily	Slight
Tsezhin-----	Severe: large stones	Severe: large stones	Severe: large stones slope small stones	Moderate: dusty large stones	Severe: large stones
406: Rock outcrop-----	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Slight	Severe: depth to rock
Nizhoni-----	Severe: fragile depth to rock	Severe: fragile depth to rock	Severe: slope fragile depth to rock	Severe: erodes easily fragile	Severe: depth to rock
407: Iwela-----	Severe: large stones slope	Severe: large stones slope	Severe: large stones slope small stones	Severe: slope	Severe: large stones slope
Nomrah-----	Slight	Slight	Severe: slope	Slight	Slight

Table 8.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
407: Vosburg-----	Slight	Slight	Moderate: slope	Slight	Slight
408: Nizhoni-----	Severe: fragile depth to rock	Severe: fragile depth to rock	Severe: slope fragile depth to rock	Severe: erodes easily fragile	Severe: depth to rock
Rock outcrop-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Moderate: slope	Severe: slope depth to rock
409: Chinlini-----	Moderate: dusty	Moderate: dusty	Moderate: dusty slope	Moderate: dusty	Slight
410: Wetherill-----	Severe: slope	Severe: slope	Severe: slope	Severe: erodes easily slope	Severe: slope
411: Sojourn-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope small stones depth to rock	Severe: slope	Severe: slope depth to rock
Badland-----	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Slight	Severe: depth to rock
412: Highdye-----	Severe: depth to rock	Severe: depth to rock	Severe: large stones slope depth to rock	Moderate: large stones	Severe: depth to rock
Menefee-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope small stones depth to rock	Moderate: slope	Severe: slope depth to rock
413: Hozho-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: large stones slope depth to rock	Severe: slope	Severe: slope depth to rock
Quezcan-----	Severe: large stones slope	Severe: large stones slope	Severe: large stones slope small stones	Severe: slope	Severe: large stones slope
Rock outcrop-----	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Slight	Severe: depth to rock

Table 8.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
414: Arabrab-----	Severe: large stones small stones	Severe: large stones small stones	Severe: large stones slope small stones	Moderate: large stones	Severe: large stones small stones
Wetherill-----	Moderate: dusty slope	Moderate: dusty slope	Severe: slope	Severe: erodes easily	Moderate: slope
415: Tsezhin-----	Severe: large stones slope small stones	Severe: large stones slope small stones	Severe: large stones slope small stones	Severe: slope	Severe: large stones slope small stones
416: Arabrab-----	Severe: large stones slope small stones	Severe: large stones slope small stones	Severe: large stones slope small stones	Severe: large stones slope	Severe: large stones slope small stones
Rock outcrop-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope	Severe: slope depth to rock
417: Wetherill-----	Severe: slope	Severe: slope	Severe: slope	Severe: erodes easily	Severe: slope
418: Menefee-----	Severe: slope small stones depth to rock	Severe: slope small stones depth to rock	Severe: slope small stones depth to rock	Severe: slope small stones	Severe: slope small stones depth to rock
Espiritu-----	Severe: large stones slope	Severe: large stones slope	Severe: large stones slope small stones	Severe: large stones slope	Severe: large stones slope droughty
Rock outcrop-----	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Slight	Severe: depth to rock
500: Whit-----	Moderate: dusty	Moderate: dusty	Moderate: dusty slope	Moderate: dusty	Slight
501: Escavada-----	Severe: flooding	Slight	Moderate: flooding	Slight	Moderate: flooding droughty
Riverwash-----	Severe: flooding too sandy wetness	Severe: too sandy wetness	Severe: flooding too sandy wetness	Severe: too sandy wetness	Severe: flooding wetness droughty
502: Sogzie-----	Slight	Slight	Moderate: slope	Slight	Slight

Table 8.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
503:					
Claysprings-----	Severe: slope small stones depth to rock	Severe: slope small stones depth to rock	Severe: slope small stones depth to rock	Severe: slope small stones	Severe: slope small stones depth to rock
Badland-----	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Slight	Severe: depth to rock
504:					
Tohona-----	Severe: excess sodium small stones	Severe: excess sodium small stones	Severe: excess sodium slope small stones	Slight	Severe: excess sodium small stones
Kimnoli-----	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Slight	Severe: depth to rock
Claysprings-----	Severe: slope small stones depth to rock	Severe: slope small stones depth to rock	Severe: slope small stones depth to rock	Severe: slope small stones	Severe: slope small stones depth to rock
505:					
Recapture-----	Severe: excess sodium	Severe: excess sodium	Severe: excess sodium	Slight	Severe: excess sodium
Shorthair-----	Severe: excess sodium depth to rock	Severe: excess sodium depth to rock	Severe: small stones depth to rock	Slight	Severe: excess sodium depth to rock
Aneth-----	Moderate: too sandy	Moderate: too sandy	Moderate: slope too sandy	Moderate: too sandy	Moderate: droughty
506:					
Blackston-----	Slight	Slight	Moderate: slope small stones	Slight	Moderate: droughty
Grazane-----	Severe: large stones slope	Severe: large stones slope	Severe: large stones slope small stones	Severe: slope	Severe: large stones slope
507:					
Sheppard-----	Moderate: too sandy	Moderate: too sandy	Moderate: slope too sandy	Moderate: too sandy	Moderate: droughty
508:					
Shalet-----	Severe: excess sodium slope depth to rock	Severe: excess sodium slope depth to rock	Severe: excess sodium slope depth to rock	Severe: slope	Severe: excess sodium slope depth to rock
Rock outcrop-----	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Slight	Severe: depth to rock

Table 8.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
509: Trail-----	Severe: flooding	Slight	Moderate: flooding slope	Slight	Moderate: flooding droughty
510: Aneth-----	Moderate: too sandy	Moderate: too sandy	Moderate: slope too sandy	Moderate: too sandy	Moderate: droughty
511: Redlands-----	Slight	Slight	Moderate: slope	Slight	Slight
512: Gotho-----	Severe: excess sodium flooding	Severe: excess sodium	Severe: excess sodium	Slight	Severe: excess sodium
513: Sogzie-----	Slight	Slight	Moderate: slope	Slight	Slight
Aneth-----	Moderate: too sandy	Moderate: too sandy	Moderate: slope too sandy	Moderate: too sandy	Moderate: droughty
514: Aneth-----	Moderate: too sandy	Moderate: too sandy	Moderate: slope too sandy	Moderate: too sandy	Moderate: droughty
515: Piute-----	Severe: depth to rock	Severe: depth to rock	Severe: slope small stones depth to rock	Moderate: too sandy	Severe: depth to rock
Bluechief-----	Slight	Slight	Moderate: slope depth to rock	Slight	Moderate: depth to rock
Rock outcrop-----	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Slight	Severe: depth to rock
516: Kaito-----	Severe: slope small stones	Severe: slope small stones	Severe: slope small stones	Severe: slope small stones	Severe: slope small stones
Claysprings-----	Severe: slope small stones depth to rock	Severe: slope small stones depth to rock	Severe: slope small stones depth to rock	Severe: slope small stones	Severe: slope small stones depth to rock
517: Moffat-----	Slight	Slight	Severe: slope	Slight	Slight

Table 8.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
518: Tohatin-----	Severe: slope	Severe: slope	Severe: slope	Moderate: slope too sandy	Severe: slope
Sheppard-----	Severe: slope	Severe: slope	Severe: slope	Moderate: slope too sandy	Severe: slope
519: Shumbegay-----	Severe: excess sodium	Severe: excess sodium	Severe: excess sodium	Moderate: too sandy	Moderate: droughty
520: Rock outcrop-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Moderate: slope	Severe: slope depth to rock
Needle-----	Severe: too sandy depth to rock	Severe: too sandy depth to rock	Severe: slope too sandy depth to rock	Severe: too sandy	Severe: depth to rock
521: Sandbench-----	Severe: too sandy	Severe: too sandy	Severe: too sandy	Severe: too sandy	Moderate: depth to rock droughty
Sheppard-----	Severe: too sandy	Severe: too sandy	Severe: too sandy	Severe: too sandy	Moderate: droughty
522: Pennell-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Slight	Severe: depth to rock
523: Tyende-----	Severe: excess sodium	Severe: excess sodium	Severe: excess sodium	Slight	Severe: excess sodium
Aneth-----	Moderate: too sandy	Moderate: too sandy	Moderate: slope too sandy	Moderate: too sandy	Moderate: droughty
Shumbegay-----	Severe: excess sodium slope	Severe: excess sodium slope	Severe: excess sodium slope	Moderate: slope too sandy	Severe: slope
524: Uzaneva-----	Severe: excess sodium flooding	Severe: excess sodium	Severe: excess sodium	Slight	Severe: excess sodium
525: Rock outcrop-----	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Slight	Severe: depth to rock
526: Sandbench-----	Severe: too sandy	Severe: too sandy	Severe: too sandy	Severe: too sandy	Moderate: depth to rock droughty

Table 8.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
526: Rock outcrop-----	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Slight	Severe: depth to rock
Piute, cool-----	Severe: depth to rock	Severe: depth to rock	Severe: small stones depth to rock	Moderate: too sandy	Severe: depth to rock
527: Outpost-----	Severe: flooding	Slight	Moderate: flooding	Slight	Moderate: flooding
528: Mack-----	Slight	Slight	Moderate: slope small stones	Slight	Slight
600: Kunz-----	Severe: large stones slope	Severe: large stones slope	Severe: large stones slope small stones	Moderate: large stones slope	Severe: large stones slope
Yahmore-----	Slight	Slight	Severe: slope	Slight	Slight
602: Bostwick-----	Slight	Slight	Moderate: slope	Slight	Slight
Canburn-----	Severe: flooding wetness	Moderate: percs slowly wetness	Severe: wetness	Moderate: wetness	Moderate: flooding wetness
604: Yahmore-----	Moderate: slope	Moderate: slope	Severe: slope	Slight	Moderate: slope
Sandark-----	Moderate: slope too sandy	Moderate: slope too sandy	Severe: slope	Moderate: too sandy	Moderate: slope droughty
606: Narbona-----	Severe: large stones slope too sandy	Severe: large stones slope too sandy	Severe: large stones slope too sandy	Severe: slope too sandy	Severe: large stones slope droughty
Deza-----	Severe: too sandy	Severe: too sandy	Severe: slope too sandy	Severe: too sandy	Severe: droughty
608: Narbona-----	Severe: large stones slope	Severe: large stones slope	Severe: large stones slope	Severe: slope	Severe: large stones slope droughty
Zilditloi-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope

Table 8.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
610: Kunz-----	Moderate: slope	Moderate: slope	Severe: slope	Slight	Moderate: slope
Xankey-----	Severe: large stones slope	Severe: large stones slope	Severe: large stones slope small stones	Severe: slope	Severe: large stones slope
612: Xankey-----	Severe: large stones slope	Severe: large stones slope	Severe: large stones slope small stones	Severe: slope	Severe: large stones slope
614: Kunz-----	Severe: large stones slope	Severe: large stones slope	Severe: large stones slope small stones	Severe: slope	Severe: large stones slope
Tuntsa-----	Moderate: slope	Moderate: slope	Severe: slope	Slight	Moderate: slope
Yahmore-----	Moderate: slope	Moderate: slope	Severe: slope	Severe: erodes easily	Moderate: slope
616: Ligai-----	Severe: large stones slope small stones	Severe: large stones slope small stones	Severe: large stones slope small stones	Severe: large stones slope small stones	Severe: large stones small stones droughty
Pastorpeak-----	Severe: large stones slope	Severe: large stones slope	Severe: large stones slope small stones	Severe: slope	Severe: large stones slope
Rock outcrop-----	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Slight	Severe: depth to rock
618: Zibetod-----	Severe: large stones slope small stones	Severe: large stones slope small stones	Severe: large stones slope small stones	Severe: slope small stones	Severe: large stones small stones droughty
Bigpaw-----	Moderate: slope	Moderate: slope	Severe: slope	Severe: erodes easily	Moderate: slope
700: Akhoni-----	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Slight	Severe: depth to rock
Retaw-----	Severe: percs slowly ponding	Severe: percs slowly ponding	Severe: percs slowly ponding	Severe: ponding	Severe: excess humus ponding
702: Bikeyah-----	Moderate: slope wetness	Moderate: slope wetness	Severe: slope	Severe: erodes easily	Moderate: slope

Table 8.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
702: Berland-----	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: erodes easily	Severe: depth to rock
704: Klizhin-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope
Captom-----	Severe: large stones slope	Severe: large stones slope	Severe: large stones slope small stones	Severe: slope	Severe: large stones slope
706: Todacheene-----	Moderate: slope	Moderate: slope	Severe: slope	Severe: erodes easily	Moderate: slope
Viewpoint-----	Severe: depth to rock	Severe: depth to rock	Severe: slope small stones depth to rock	Slight	Severe: depth to rock
Owlspring-----	Severe: flooding	Moderate: flooding wetness	Severe: flooding	Severe: erodes easily	Severe: flooding
708: Tunitcha-----	Severe: large stones slope small stones	Severe: large stones slope small stones	Severe: large stones slope small stones	Severe: slope	Severe: large stones slope small stones
Bangston-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope
710: Akhoni-----	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Slight	Severe: depth to rock
Klizhin-----	Severe: slope	Severe: slope	Severe: slope	Moderate: slope	Severe: slope
712: Sonsela-----	Severe: large stones slope	Severe: large stones slope	Severe: large stones slope small stones	Severe: slope	Severe: slope
Washpass-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope
Viewpoint-----	Severe: slope small stones depth to rock	Severe: slope small stones depth to rock	Severe: slope small stones depth to rock	Severe: slope	Severe: slope small stones depth to rock
W: Water-----	---	---	---	---	---

(See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable.)

[illegible]

Table 9.--Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Conif- erous plants	Shrubs	Wetland plants	Shallow water areas	Open- land wild- life	Wood- land wild- life	Wetland wild- life	Range- land wild- life
120:											
Nageezi-----	Very poor	Very poor	Poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor
Denazar-----	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor
122:											
Blueflat-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
Notal-----	Very poor	Very poor	Very poor	Very poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor
125:											
Kimбето-----	Very poor	Very poor	Poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor
130:											
Badland-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
Genats-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
133:											
Razito-----	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor
135:											
Farb-----	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor
Rock outcrop-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
Badland-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
137:											
Persayo-----	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor
Cairn-----	Very poor	Very poor	Poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor
Patel-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
140:											
Benally-----	Poor	Poor	Very poor	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor	Very poor

Table 9.--Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Conif- erous plants	Shrubs	Wetland plants	Shallow water areas	Open- land wild- life	Wood- land wild- life	Wetland wild- life	Range- land wild- life
142:											
Bebeever-----	Poor	Poor	Fair	Very poor	Fair	Poor	Poor	Poor	Poor	Poor	Fair
Walrees-----	Poor	Fair	Fair	Poor	Poor	Fair	Fair	Poor	Poor	Fair	Poor
145:											
Razito-----	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor
Huerfano-----	Very poor	Very poor	Very poor	Very poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor
147:											
Escavada-----	Poor	Poor	Poor	Poor	Poor	Poor	Very poor	Poor	Poor	Very poor	Poor
150:											
Chipeta-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
Badland-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
Moncisco-----	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor
153:											
Green River-----	Good	Good	Poor	Poor	Poor	Poor	Poor	Fair	Poor	Poor	Poor
Green River, saline----	Poor	Poor	Very poor	Very poor	Very poor	Poor	Poor	Poor	Very poor	Poor	Very poor
155:											
Mesa-----	Very poor	Very poor	Poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor
157:											
Werjo, saline-----	Very poor	Very poor	Very poor	Very poor	Very poor	Poor	Poor	Very poor	Very poor	Poor	Very poor
Werjo-----	Good	Good	Fair	Fair	Fair	Fair	Fair	Good	Fair	Fair	Fair
160:											
Notal-----	Very poor	Very poor	Very poor	Very poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor
Escavada-----	Poor	Poor	Poor	Poor	Poor	Poor	Very poor	Poor	Poor	Very poor	Poor
Riverwash-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor	Very poor	Very poor	Poor	Very poor
163:											
Werlog-----	Very poor	Very poor	Very poor	Very poor	Very poor	Fair	Fair	Very poor	Very poor	Fair	Very poor

Table 9.--Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herba- and ceous plants	Conif- erous plants	Shrubs	Wetland plants	Shallow water areas	Open- land wild- life	Wood- land wild- life	Wetland wild- life	Range- land wild- life
165:											
Jeddito-----	Very poor	Very poor	Poor	---	Poor	Poor	Very poor	Very poor	---	Very poor	Poor
Escavada-----	Poor	Poor	Poor	Poor	Poor	Poor	Very poor	Poor	Poor	Very poor	Poor
167:											
Hoskay-----	Very poor	Very poor	Very poor	Very poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor
Patel-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
Badland-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
170:											
Notal-----	Very poor	Very poor	Very poor	Very poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor
173:											
Shiprock-----	Very poor	Very poor	Poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor
175:											
Suwanee-----	Poor	Poor	Fair	Very poor	Fair	Poor	Very poor	Poor	Poor	Very poor	Fair
177:											
Notal-----	Very poor	Very poor	Very poor	Very poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor
180:											
Kimbeto-----	Very poor	Very poor	Poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor
Huerfano-----	Very poor	Very poor	Very poor	Very poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor
183:											
Gyptur-----	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor	Very poor	Very poor	Very poor
190:											
Jeddito-----	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor
195:											
Tewa-----	Very poor	Very poor	Poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor
200:											
Tocito-----	Fair	Good	Poor	Fair	Poor	Poor	Very poor	Fair	Fair	Very poor	Poor

Table 9.--Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Conif- erous plants	Shrubs	Wetland plants	Shallow water areas	Open- land wild- life	Wood- land wild- life	Wetland wild- life	Range- land wild- life
205: Shiprock-----	Very poor	Very poor	Poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor
Farb-----	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor
210: Mack-----	Very poor	Very poor	Poor	---	Poor	Poor	Very poor	Very poor	---	Very poor	Very poor
Mesa-----	Very poor	Very poor	Poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor
215: Persayo-----	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor
Fordbutte-----	Very poor	Very poor	Poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor
220: Chinde-----	Very poor	Very poor	Very poor	Very poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor
230: Ravola-----	Very poor	Very poor	Poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor
235: Wingrock-----	Very poor	Very poor	Poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor
Rock outcrop-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
240: Nageezi-----	Very poor	Very poor	Poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor
245: Tsebitai-----	Very poor	Very poor	Poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor
250: Littlehat-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
Persayo-----	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor
Nataani-----	Very poor	Very poor	Poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor
255: Benally-----	Very poor	Very poor	Very poor	---	Very poor	Poor	Very poor	Very poor	---	Very poor	Very poor

Table 9.--Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Conif- erous plants	Shrubs	Wetland plants	Shallow water areas	Open- land wild- life	Wood- land wild- life	Wetland wild- life	Range- land wild- life
260:											
Littlehat-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
Persayo-----	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor
Badland-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
265:											
Camac-----	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor
Kimbeto-----	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor
Badland-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
270:											
Fruitland-----	Very poor	Very poor	Poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor
275:											
Razito-----	Poor	Poor	Poor	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor	Poor
285:											
Water-----	---	---	---	---	---	---	---	---	---	---	---
Riverwash-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor	Very poor	Very poor	Poor	Very poor
290:											
Mesa-----	Good	Good	Poor	---	Poor	Good	Very poor	Fair	---	Poor	Poor
295:											
Mesa-----	Good	Good	Poor	---	Poor	Good	Very poor	Fair	---	Poor	Poor
300:											
Farview-----	Very poor	Very poor	Poor	Poor	Poor	Very poor	Very poor	Very poor	Poor	Very poor	Poor
Rock outcrop-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
301:											
Farview-----	Very poor	Very poor	Poor	Poor	Poor	Very poor	Very poor	Very poor	Poor	Very poor	Poor
Sanostee-----	Poor	Poor	Poor	Poor	Poor	Poor	Very poor	Poor	Poor	Very poor	Poor

Table 9.--Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Conif- erous plants	Shrubs	Wetland plants	Shallow water areas	Open- land wild- life	Wood- land wild- life	Wetland wild- life	Range- land wild- life
301: Rock outcrop-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
302: Doakum-----	Poor	Poor	Poor	Poor	Poor	Poor	Very poor	Poor	Poor	Very poor	Poor
303: Snapill-----	Poor	Poor	Fair	Poor	Fair	Poor	Very poor	Poor	Poor	Very poor	Fair
304: Farview-----	Very poor	Very poor	Poor	Poor	Poor	Very poor	Very poor	Very poor	Poor	Very poor	Poor
Beclabito-----	Poor	Poor	Poor	Poor	Poor	Poor	Very poor	Poor	Poor	Very poor	Poor
Rock outcrop-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
305: Strych-----	Very poor	Very poor	Fair	Poor	Fair	Very poor	Very poor	Poor	Poor	Very poor	Fair
Eagleeye-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
Rock outcrop-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
306: Arches-----	Very poor	Very poor	Poor	Poor	Poor	Very poor	Very poor	Very poor	Poor	Very poor	Poor
Kitsili-----	Poor	Poor	Fair	Poor	Fair	Poor	Very poor	Poor	Poor	Very poor	Fair
Mido-----	Very poor	Very poor	Fair	Poor	Fair	Very poor	Very poor	Poor	Poor	Very poor	Fair
307: Bodot-----	Very poor	Very poor	Poor	Poor	Poor	Very poor	Very poor	Very poor	Poor	Very poor	Poor
Beclabito-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
Rock outcrop-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
308: Mcelmo-----	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor	Very poor	Very poor	Very poor

Table 9.--Wildlife Habitat--Continued

[illegible]

Table 9.--Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Conif- erous plants	Shrubs	Wetland plants	Shallow water areas	Open- land wild- life	Wood- land wild- life	Wetland wild- life	Range- land wild- life
316:											
Millett-----	Poor	Poor	Fair	Poor	Fair	Very poor	Very poor	Poor	Poor	Very poor	Fair
Strych-----	Very poor	Very poor	Fair	Poor	Fair	Very poor	Very poor	Poor	Poor	Very poor	Fair
Doakum-----	Poor	Poor	Fair	Poor	Fair	Very poor	Very poor	Poor	Poor	Very poor	Fair
317:											
Toadlena-----	Very poor	Very poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor	Very poor	Very poor
Eagleye-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
318:											
Camino-----	Poor	Poor	Poor	Poor	Poor	Poor	Very poor	Poor	Poor	Very poor	Poor
319:											
Skyhawk-----	Very poor	Very poor	Fair	Poor	Fair	Very poor	Very poor	Very poor	Poor	Very poor	Fair
Lavellga-----	Very poor	Poor	Fair	Poor	Fair	Very poor	Very poor	Poor	Poor	Very poor	Fair
320:											
Beclabito-----	Poor	Poor	Fair	Poor	Fair	Poor	Very poor	Poor	Poor	Very poor	Fair
Kinusta-----	Very poor	Very poor	Fair	Poor	Fair	Very poor	Very poor	Very poor	Poor	Very poor	Fair
Badland-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
400:											
Wetherill-----	Poor	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor	Fair
Atlatl-----	Poor	Fair	Fair	Fair	Fair	Poor	Very poor	Fair	Fair	Very poor	Fair
401:											
Vessilla-----	Very poor	Very poor	Poor	Poor	Poor	Very poor	Very poor	Very poor	Poor	Very poor	Poor
Rock outcrop-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
402:											
Chazner-----	Poor	Poor	Fair	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor	Fair

Table 9.--Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Conif- erous plants	Shrubs	Wetland plants	Shallow water areas	Open- land wild- life	Wood- land wild- life	Wetland wild- life	Range- land wild- life
403:											
Chazner-----	Poor	Poor	Fair	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor	Fair
Katzine-----	Poor	Fair	Fair	Poor	Fair	Very poor	Very poor	Poor	Poor	Very poor	Fair
404:											
Wetherill-----	Poor	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor	Fair
Tsezhin-----	Poor	Poor	Fair	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor	Fair
406:											
Rock outcrop-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
Nizhoni-----	Very poor	Very poor	Poor	Poor	Fair	Very poor	Very poor	Very poor	Poor	Very poor	Poor
407:											
Iwela-----	Poor	Poor	Fair	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor	Fair
Nomrah-----	Poor	Fair	Fair	Fair	Fair	Poor	Very poor	Fair	Fair	Very poor	Fair
Vosburg-----	Poor	Fair	Fair	Poor	Fair	Poor	Very poor	Poor	Poor	Very poor	Fair
408:											
Nizhoni-----	Very poor	Very poor	Poor	Poor	Fair	Very poor	Very poor	Very poor	Poor	Very poor	Poor
Rock outcrop-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
409:											
Chinlini-----	Poor	Fair	Fair	Poor	Fair	Poor	Very poor	Fair	Poor	Very poor	Fair
410:											
Wetherill-----	Very poor	Very poor	Fair	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor	Fair
411:											
Sojourn-----	Very poor	Very poor	Poor	Poor	Fair	Very poor	Very poor	Very poor	Poor	Very poor	Poor
Badland-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
412:											
Highdye-----	Very poor	Very poor	Fair	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor	Fair

Table 9.--Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Conif- erous plants	Shrubs	Wetland plants	Shallow water areas	Open- land wild- life	Wood- land wild- life	Wetland wild- life	Range- land wild- life
412: Menefee-----	Very poor	Very poor	Fair	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor	Fair
413: Hozho-----	Very poor	Very poor	Fair	Poor	Fair	Very poor	Very poor	Poor	Poor	Very poor	Fair
Quezcan-----	Very poor	Very poor	Fair	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor	Fair
Rock outcrop-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
414: Arabrab-----	Very poor	Very poor	Fair	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor	Fair
Wetherill-----	Poor	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor	Fair
415: Tsezhin-----	Very poor	Very poor	Fair	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor	Fair
416: Arabrab-----	Very poor	Very poor	Fair	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor	Fair
Rock outcrop-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
417: Wetherill-----	Poor	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor	Fair
418: Menefee-----	Very poor	Very poor	Fair	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor	Fair
Espiritu-----	Very poor	Very poor	Fair	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor	Fair
Rock outcrop-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
500: Whit-----	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor
501: Escavada-----	Poor	Poor	Poor	Poor	Poor	Poor	Very poor	Poor	Poor	Very poor	Poor
Riverwash-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor	Very poor	Very poor	Poor	Very poor

Table 9.--Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Conif- erous plants	Shrubs	Wetland plants	Shallow water areas	Open- land wild- life	Wood- land wild- life	Wetland wild- life	Range- land wild- life
502: Sogzie-----	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor
503: Claysprings-----	Very poor	Very poor	Very poor	---	Very poor	Very poor	Very poor	Very poor	---	Very poor	Very poor
Badland-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
504: Tohona-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
Kimnoli-----	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor
Claysprings-----	Very poor	Very poor	Very poor	---	Very poor	Very poor	Very poor	Very poor	---	Very poor	Very poor
505: Recapture-----	Very poor	Very poor	Very poor	Very poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor
Shorthair-----	Very poor	Very poor	Very poor	Very poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor
Aneth-----	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor
506: Blackston-----	Very poor	Very poor	Poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor
Grazane-----	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor
507: Sheppard-----	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor
508: Shalet-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
Rock outcrop-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
509: Trail-----	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor
510: Aneth-----	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor

Table 9.--Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Conif- erous plants	Shrubs	Wetland plants	Shallow water areas	Open- land wild- life	Wood- land wild- life	Wetland wild- life	Range- land wild- life
511: Redlands-----	Very poor	Very poor	Poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor
512: Gotho-----	Very poor	Very poor	Poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor
513: Sogzie-----	Very poor	Very poor	Poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor
Aneth-----	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor
514: Aneth-----	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor
515: Piute-----	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor
Bluechief-----	Very poor	Very poor	Poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor
Rock outcrop-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
516: Kaito-----	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor
Claysprings-----	Very poor	Very poor	Very poor	---	Very poor	Very poor	Very poor	Very poor	---	Very poor	Very poor
517: Moffat-----	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor
518: Tohatin-----	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor
Sheppard-----	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor
519: Shumbegay-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
520: Rock outcrop-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
Needle-----	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor

Table 9.--Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Conif- erous plants	Shrubs	Wetland plants	Shallow water areas	Open- land wild- life	Wood- land wild- life	Wetland wild- life	Range- land wild- life
521:											
Sandbench-----	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor
Sheppard-----	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor
522:											
Pennell-----	Very poor	Very poor	Poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor
523:											
Tyende-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
Aneth-----	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor
Shumbegay-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
524:											
Uzaneva-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
525:											
Rock outcrop-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
526:											
Sandbench-----	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor
Rock outcrop-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
Piute, cool-----	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor
527:											
Outpost-----	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor
528:											
Mack-----	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor
600:											
Kunz-----	Very poor	Very poor	Good	Good	Fair	Very poor	Very poor	Poor	Fair	Very poor	Fair
Yahmore-----	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor	Good

Table 9.--Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Conif- erous plants	Shrubs	Wetland plants	Shallow water areas	Open- land wild- life	Wood- land wild- life	Wetland wild- life	Range- land wild- life
602: Bostwick-----	Poor	Fair	Fair	Fair	Fair	Poor	Very poor	Poor	Fair	Very poor	Fair
Canburn-----	Fair	Fair	Good	Poor	Fair	Good	Poor	Fair	Poor	Fair	Fair
604: Yahmore-----	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor	Good
Sandark-----	Poor	Poor	Fair	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor	Fair
606: Narbona-----	Poor	Poor	Fair	Good	Good	Very poor	Very poor	Poor	Fair	Very poor	Fair
Deza-----	Poor	Poor	Fair	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor	Fair
608: Narbona-----	Poor	Poor	Fair	Good	Good	Very poor	Very poor	Poor	Fair	Very poor	Fair
Zilditloi-----	Very poor	Very poor	Fair	Poor	Fair	Very poor	Very poor	Poor	Poor	Very poor	Fair
610: Kunz-----	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor	Good
Xankey-----	Very poor	Very poor	Fair	Good	Fair	Very poor	Very poor	Poor	Fair	Very poor	Fair
612: Xankey-----	Very poor	Very poor	Fair	Good	Fair	Very poor	Very poor	Poor	Fair	Very poor	Fair
614: Kunz-----	Very poor	Very poor	Good	Good	Fair	Very poor	Very poor	Poor	Fair	Very poor	Fair
Tuntsa-----	Poor	Fair	Good	Poor	Good	Very poor	Very poor	Fair	Fair	Very poor	Good
Yahmore-----	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor	Good
616: Ligai-----	Very poor	Very poor	Fair	Good	Fair	Very poor	Very poor	Poor	Fair	Very poor	Fair
Pastorpeak-----	Very poor	Very poor	Good	Good	Fair	Very poor	Very poor	Poor	Fair	Very poor	Fair

Table 9.--Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Conif- erous plants	Shrubs	Wetland plants	Shallow water areas	Open- land wild- life	Wood- land wild- life	Wetland wild- life	Range- land wild- life
616: Rock outcrop-----	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor
618: Zibetod-----	Very poor	Very poor	Fair	Poor	Fair	Very poor	Very poor	Poor	Poor	Very poor	Fair
Bigpaw-----	Poor	Fair	Good	Fair	Good	Poor	Very poor	Fair	Fair	Very poor	Good
700: Akhoni-----	Very poor	Very poor	Fair	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor	Fair
Retaw-----	Very poor	Poor	Very poor	Very poor	Very poor	Good	Good	Very poor	Very poor	Good	Very poor
702: Bikeyah-----	Poor	Fair	Good	Very poor	Good	Poor	Poor	Fair	Poor	Poor	Good
Berland-----	Very poor	Very poor	Poor	Poor	Poor	Very poor	Very poor	Very poor	Poor	Very poor	Poor
704: Klizhin-----	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor	Good
Captom-----	Very poor	Very poor	Good	Good	Good	Very poor	Very poor	Poor	Fair	Very poor	Good
706: Todacheene-----	Poor	Fair	Good	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor	Fair
Viewpoint-----	Very poor	Very poor	Poor	Poor	Fair	Very poor	Very poor	Very poor	Poor	Very poor	Poor
Owlspring-----	Poor	Fair	Good	Poor	Fair	Poor	Very poor	Fair	Fair	Very poor	Fair
708: Tunitcha-----	Very poor	Very poor	Good	Good	Good	Very poor	Very poor	Poor	Fair	Very poor	Good
Bangston-----	Very poor	Very poor	Fair	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor	Fair
710: Akhoni-----	Very poor	Very poor	Fair	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor	Fair
Klizhin-----	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor	Good

Table 9.--Wildlife Habitat--Continued

[illegible]

Table 10.--Building Site Development

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable.)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Unsurfaced roads	Fencing	Lawns and landscaping
100: Werito-----	Moderate: too clayey depth to rock	Moderate: shrink-swell	Moderate: shrink-swell depth to rock	Moderate: shrink-swell	Severe: low strength	Severe: low strength	Severe: too clayey	Severe: excess sodium
102: Blackston-----	Severe: cutbanks cave	Slight	Slight	Slight	Slight	Slight	Moderate: too gravelly	Moderate: large stones small stones droughty
Camac-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: low strength slope	Severe: low strength	Severe: slope	Severe: large stones slope small stones
Rock outcrop-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock slope	Severe: depth to rock slope	Severe: depth to rock
105: Hamburn-----	Moderate: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding low strength	Severe: low strength flooding	Severe: flooding	Severe: excess sodium flooding
107: Tocito-----	Slight	Severe: flooding	Severe: flooding	Severe: flooding	Severe: low strength	Severe: low strength	Slight	Slight
Gullied land-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: low strength slope	Severe: low strength slope	Severe: slope	Severe: slope
110: Brimhall-----	Slight	Slight	Slight	Slight	Slight	Moderate: low strength dusty	Moderate: excess salt	Slight
Benally-----	Slight	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: shrink-swell	Severe: low strength	Severe: low strength	Moderate: excess salt	Severe: excess sodium

Table 10.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Unsurfaced roads	Fencing	Lawns and landscaping
110: Genats-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: low strength slope	Severe: low strength slope	Severe: too clayey slope	Severe: excess sodium slope
113: Gyptur-----	Slight	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: shrink-swell	Severe: low strength	Severe: low strength	Moderate: excess salt	Severe: excess sodium
115: Denazar-----	Severe: cutbanks cave	Slight	Slight	Slight	Slight	Slight	Moderate: too sandy	Moderate: droughty
Farb-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock slope	Severe: depth to rock
117: Badland-----	Severe: depth to rock	Moderate: slope depth to rock	Severe: depth to rock	Severe: slope	Moderate: slope depth to rock	Severe: low strength slope	Severe: depth to rock slope	Severe: depth to rock
Rock outcrop-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock slope	Severe: depth to rock slope	Severe: depth to rock
120: Nageezi-----	Severe: cutbanks cave	Slight	Slight	Moderate: slope	Slight	Moderate: low strength	Slight	Slight
Denazar-----	Severe: cutbanks cave	Slight	Slight	Slight	Slight	Slight	Moderate: too sandy	Moderate: droughty
122: Blueflat-----	Moderate: too clayey depth to rock	Moderate: shrink-swell	Moderate: shrink-swell depth to rock	Moderate: shrink-swell	Severe: low strength	Severe: low strength	Moderate: excess salt	Severe: excess sodium
Notal-----	Moderate: too clayey	Severe: flooding	Severe: flooding	Severe: flooding	Severe: low strength	Severe: low strength	Moderate: excess salt	Severe: excess sodium
125: Kimbeto-----	Slight	Slight	Slight	Slight	Slight	Moderate: low strength dusty	Moderate: excess salt	Severe: excess sodium

Table 10.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Unsurfaced roads	Fencing	Lawns and landscaping
130: Badland-----	Severe: depth to rock	Moderate: slope depth to rock	Severe: depth to rock	Severe: slope	Moderate: slope depth to rock	Severe: low strength slope	Severe: depth to rock slope	Severe: depth to rock
Genats-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: low strength slope	Severe: low strength	Severe: too clayey slope	Severe: excess sodium slope
133: Razito-----	Severe: cutbanks cave	Slight	Slight	Slight	Slight	Slight	Severe: too sandy	Severe: droughty
135: Farb-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock slope	Severe: depth to rock
Rock outcrop-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock slope	Severe: depth to rock slope	Severe: depth to rock
Badland-----	Severe: depth to rock	Moderate: slope depth to rock	Severe: depth to rock	Severe: slope	Moderate: slope depth to rock	Severe: slope	Severe: depth to rock slope	Severe: depth to rock
137: Persayo-----	Severe: depth to rock	Moderate: slope depth to rock	Severe: depth to rock	Severe: slope	Severe: low strength	Severe: low strength	Severe: depth to rock	Severe: depth to rock
Cairn-----	Moderate: large stones	Moderate: large stones	Moderate: large stones	Moderate: large stones	Moderate: large stones	Severe: low strength	Severe: too gravelly	Moderate: large stones small stones droughty
Patel-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: low strength slope	Severe: low strength	Moderate: excess salt	Severe: excess sodium slope small stones
140: Benally-----	Severe: cutbanks cave	Severe: flooding	Severe: flooding	Severe: flooding	Severe: low strength	Severe: low strength	Slight	Severe: excess sodium

Table 10.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Unsurfaced roads	Fencing	Lawns and landscaping
142: Bebeevar-----	Severe: cutbanks cave	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Moderate: flooding too gravelly	Severe: droughty
Walrees-----	Severe: wetness cutbanks cave	Severe: flooding	Severe: flooding wetness	Severe: flooding	Severe: flooding	Severe: wetness flooding	Severe: flooding	Severe: flooding
145: Razito-----	Severe: cutbanks cave	Slight	Slight	Moderate: slope	Slight	Slight	Moderate: too sandy	Moderate: droughty
Huerfano-----	Severe: depth to rock	Moderate: shrink-swell depth to rock	Severe: depth to rock	Moderate: shrink-swell depth to rock	Severe: low strength	Severe: low strength	Severe: depth to rock	Severe: excess sodium depth to rock
147: Escavada-----	Severe: cutbanks cave	Severe: flooding	Severe: flooding	Severe: flooding	Moderate: flooding	Moderate: wetness flooding	Severe: too sandy	Severe: droughty
150: Chipeta-----	Severe: slope depth to rock	Severe: slope	Severe: slope depth to rock	Severe: slope	Severe: slope depth to rock	Severe: low strength shrink-swell	Severe: depth to rock slope	Severe: excess sodium excess salt slope
Badland-----	Severe: depth to rock	Moderate: slope depth to rock	Severe: depth to rock	Severe: slope	Moderate: slope depth to rock	Severe: low strength slope	Severe: depth to rock slope	Severe: depth to rock
Moncisco-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Moderate: large stones	Severe: too gravelly slope	Severe: slope small stones droughty
153: Green River-----	Severe: cutbanks cave	Severe: flooding	Severe: flooding	Severe: flooding	Moderate: flooding frost action	Moderate: low strength wetness flooding	Slight	Slight

Table 10.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Unsurfaced roads	Fencing	Lawns and landscaping
153: Green River, saline-----	Severe: cutbanks cave	Severe: flooding	Severe: flooding	Severe: flooding	Moderate: flooding frost action	Moderate: low strength wetness flooding	Moderate: excess salt	Moderate: droughty
155: Mesa-----	Slight	Slight	Slight	Slight	Slight	Severe: low strength	Moderate: too cobbly	Slight
157: Werjo, saline-----	Moderate: wetness	Severe: flooding	Severe: flooding	Severe: flooding	Moderate: flooding frost action low strength	Severe: low strength	Moderate: excess salt	Severe: excess sodium droughty
Werjo-----	Moderate: wetness	Severe: flooding	Severe: flooding	Severe: flooding	Moderate: flooding frost action low strength	Severe: low strength	Slight	Slight
160: Notal-----	Moderate: too clayey	Severe: flooding	Severe: flooding	Severe: flooding	Severe: low strength	Severe: low strength	Moderate: excess salt	Severe: excess sodium
Escavada-----	Severe: cutbanks cave	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Moderate: flooding too sandy	Moderate: flooding droughty
Riverwash-----	Severe: wetness cutbanks cave	Severe: flooding wetness	Severe: flooding wetness	Severe: flooding wetness	Severe: flooding wetness	Severe: wetness flooding	Severe: flooding wetness too sandy	Severe: flooding wetness droughty
163: Werlog-----	Severe: wetness	Severe: flooding	Severe: flooding wetness	Severe: flooding	Severe: low strength	Severe: low strength wetness	Moderate: excess salt	Severe: excess sodium excess salt
165: Jeddito-----	Severe: cutbanks cave	Severe: flooding	Severe: flooding	Severe: flooding	Moderate: flooding	Moderate: low strength flooding	Slight	Severe: excess sodium

Table 10.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Unsurfaced roads	Fencing	Lawns and landscaping
165: Escavada-----	Severe: cutbanks cave	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Moderate: flooding too sandy	Moderate: flooding droughty
167: Hoskay-----	Moderate: too clayey	Severe: shrink-swell	Severe: shrink-swell	Severe: shrink-swell	Severe: low strength shrink-swell	Severe: low strength shrink-swell	Severe: shrink-swell	Severe: excess sodium
Patel-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: low strength slope	Severe: low strength	Moderate: excess salt slope	Severe: excess sodium slope
Badland-----	Severe: slope depth to rock	Severe: slope	Severe: slope depth to rock	Severe: slope	Severe: slope	Severe: low strength	Severe: depth to rock	Severe: slope depth to rock
170: Notal-----	Moderate: too clayey	Severe: flooding	Severe: flooding	Severe: flooding	Severe: low strength	Severe: low strength	Moderate: excess salt	Severe: excess sodium
173: Shiprock-----	Slight	Slight	Slight	Slight	Slight	Moderate: low strength dusty	Slight	Slight
175: Suwanee-----	Moderate: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Severe: low strength flooding	Moderate: flooding	Moderate: flooding
177: Notal-----	Moderate: too clayey	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: shrink-swell	Severe: low strength	Severe: low strength	Moderate: excess salt	Severe: excess sodium
180: Kimbeto-----	Slight	Slight	Slight	Slight	Slight	Moderate: low strength dusty	Slight	Severe: excess sodium
Huerfano-----	Severe: depth to rock	Moderate: shrink-swell depth to rock	Severe: depth to rock	Moderate: shrink-swell depth to rock	Severe: low strength	Severe: low strength	Severe: depth to rock	Severe: excess sodium depth to rock

Table 10.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Unsurfaced roads	Fencing	Lawns and landscaping
183: Gyptur-----	Moderate: slope	Moderate: slope	Moderate: slope	Severe: slope	Moderate: low strength slope	Severe: low strength	Moderate: excess salt slope	Severe: excess sodium
190: Jeddito-----	Severe: cutbanks cave	Severe: flooding	Severe: flooding	Severe: flooding	Moderate: flooding	Moderate: low strength flooding	Slight	Moderate: droughty
195: Tewa-----	Moderate: slope	Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope	Severe: low strength	Moderate: slope	Moderate: slope
200: Tocito-----	Slight	Slight	Moderate: shrink-swell	Slight	Severe: low strength	Severe: low strength	Slight	Slight
205: Shiprock-----	Slight	Slight	Slight	Slight	Slight	Moderate: low strength dusty	Slight	Slight
Farb-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock
210: Mack-----	Slight	Slight	Slight	Slight	Slight	Severe: low strength	Slight	Slight
Mesa-----	Slight	Slight	Slight	Slight	Slight	Severe: low strength	Moderate: too cobbly	Slight
215: Persayo-----	Severe: depth to rock	Moderate: depth to rock	Severe: depth to rock	Moderate: slope depth to rock	Severe: low strength	Severe: low strength	Severe: depth to rock	Severe: depth to rock
Fordbutte-----	Moderate: depth to rock	Slight	Moderate: depth to rock	Slight	Severe: low strength	Severe: low strength	Slight	Severe: excess sodium
220: Chinde-----	Moderate: too clayey	Severe: shrink-swell	Severe: shrink-swell	Severe: shrink-swell	Severe: low strength shrink-swell	Severe: low strength shrink-swell	Severe: shrink-swell	Severe: excess sodium

Table 10.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Unsurfaced roads	Fencing	Lawns and landscaping
230: Ravola-----	Moderate: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding low strength	Severe: low strength flooding	Moderate: flooding	Moderate: flooding
235: Wingrock-----	Severe: cutbanks cave	Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope	Slight	Moderate: too gravelly slope	Moderate: slope small stones droughty
Rock outcrop-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock slope	Severe: depth to rock slope	Severe: depth to rock
240: Nageezi-----	Severe: cutbanks cave	Slight	Slight	Slight	Slight	Moderate: low strength dusty	Slight	Slight
245: Tsebitai-----	Slight	Slight	Slight	Slight	Slight	Moderate: low strength dusty	Slight	Slight
250: Littlehat-----	Moderate: slope depth to rock	Moderate: shrink-swell slope	Moderate: shrink-swell slope depth to rock	Severe: slope	Severe: low strength	Severe: low strength	Moderate: excess salt	Severe: excess sodium excess salt droughty
Persayo-----	Severe: depth to rock	Moderate: depth to rock	Severe: depth to rock	Moderate: depth to rock	Severe: low strength	Severe: low strength	Severe: depth to rock	Severe: depth to rock
Nataani-----	Moderate: depth to rock	Slight	Moderate: depth to rock	Slight	Slight	Moderate: low strength dusty	Moderate: excess salt	Moderate: depth to rock
255: Benally-----	Slight	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: shrink-swell	Severe: low strength	Severe: low strength	Moderate: excess salt	Severe: excess sodium

Table 10.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Unsurfaced roads	Fencing	Lawns and landscaping
260:								
Littlehat-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: low strength slope	Severe: low strength	Moderate: slope excess salt	Severe: excess sodium excess salt slope
Persayo-----	Severe: depth to rock	Moderate: slope depth to rock	Severe: depth to rock	Severe: slope	Severe: low strength	Severe: low strength	Severe: depth to rock	Severe: depth to rock
Badland-----	Severe: depth to rock	Moderate: slope depth to rock	Severe: depth to rock	Severe: slope	Moderate: slope depth to rock	Severe: low strength slope	Severe: depth to rock slope	Severe: depth to rock
265:								
Camac-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: low strength slope	Severe: low strength	Severe: slope	Severe: large stones slope small stones
Kimbeto-----	Slight	Slight	Slight	Slight	Slight	Severe: low strength	Moderate: excess salt	Severe: excess sodium
Badland-----	Severe: depth to rock	Moderate: slope depth to rock	Severe: depth to rock	Severe: slope	Moderate: slope depth to rock	Severe: low strength slope	Severe: depth to rock slope	Severe: depth to rock
270:								
Fruitland-----	Slight	Slight	Slight	Slight	Slight	Moderate: low strength	Slight	Slight
275:								
Razito-----	Severe: cutbanks cave	Slight	Slight	Moderate: slope	Slight	Slight	Moderate: to sandy	Moderate: droughty
285:								
Water-----	---	---	---	---	---	---	---	---
Riverwash-----	Severe: wetness cutbanks cave	Severe: flooding wetness	Severe: flooding wetness	Severe: flooding wetness	Severe: flooding wetness	Severe: wetness flooding	Severe: flooding wetness	Severe: small stones wetness droughty

Table 10.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Unsurfaced roads	Fencing	Lawns and landscaping
290: Mesa-----	Severe: cutbanks cave	Moderate: shrink-swell	Moderate: wetness	Moderate: shrink-swell	Moderate: low strength shrink-swell	Severe: low strength	Slight	Slight
295: Mesa-----	Severe: cutbanks cave	Moderate: shrink-swell	Moderate: wetness	Moderate: shrink-swell	Moderate: low strength shrink-swell	Severe: low strength	Slight	Slight
300: Farview-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock
Rock outcrop-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock
301: Farview-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock
Sanostee-----	Severe: depth to rock	Moderate: depth to rock	Severe: depth to rock	Moderate: slope depth to rock	Moderate: depth to rock	Severe: low strength	Severe: depth to rock	Moderate: depth to rock droughty
Rock outcrop-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock
302: Doakum-----	Moderate: depth to rock	Slight	Moderate: depth to rock	Moderate: slope	Slight	Severe: low strength	Slight	Slight
303: Snapill-----	Slight	Slight	Slight	Slight	Moderate: low strength	Severe: low strength	Slight	Severe: excess sodium
304: Farview-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock

Table 10.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Unsurfaced roads	Fencing	Lawns and landscaping
304: Beclabito-----	Moderate: depth to rock	Slight	Moderate: depth to rock	Slight	Slight	Severe: low strength	Slight	Severe: excess sodium
Rock outcrop-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock
305: Strych-----	Severe: slope cutbanks cave	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: large stones	Severe: too stony slope	Severe: large stones slope small stones
Eagleye-----	Severe: slope depth to rock	Severe: shrink-swell slope	Severe: shrink-swell slope depth to rock	Severe: shrink-swell slope	Severe: low strength shrink-swell slope	Severe: low strength shrink-swell	Severe: shrink-swell slope	Severe: slope small stones depth to rock
Rock outcrop-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock slope	Severe: depth to rock slope	Severe: depth to rock
306: Arches-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock slope	Severe: depth to rock
Kitsili-----	Slight	Slight	Slight	Slight	Slight	Moderate: low strength dusty	Slight	Slight
Mido-----	Severe: cutbanks cave	Slight	Slight	Moderate: slope	Slight	Slight	Moderate: too sandy slope	Moderate: droughty
307: Bodot-----	Severe: slope	Severe: shrink-swell slope	Severe: shrink-swell slope	Severe: shrink-swell slope	Severe: low strength shrink-swell slope	Severe: low strength shrink-swell	Severe: too clayey shrink-swell slope	Severe: large stones slope small stones

Table 10.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Unsurfaced roads	Fencing	Lawns and landscaping
307: Beclabito-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: low strength	Severe: too gravelly slope	Severe: excess sodium large stones slope
Rock outcrop-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock slope	Severe: depth to rock slope	Severe: depth to rock
308: McElmo-----	Moderate: slope too clayey	Severe: shrink-swell	Severe: shrink-swell	Severe: shrink-swell slope	Severe: low strength shrink-swell	Severe: low strength shrink-swell	Severe: shrink-swell	Severe: excess sodium small stones
Farview-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock
309: Rock outcrop-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock slope	Severe: depth to rock slope	Severe: depth to rock
Rizno-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock slope	Severe: depth to rock
310: Millett-----	Slight	Slight	Slight	Moderate: slope	Slight	Slight	Moderate: too gravelly	Moderate: small stones droughty
Blanding-----	Slight	Slight	Slight	Moderate: slope	Severe: low strength	Severe: low strength	Slight	Slight
Strych-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Moderate: slope large stones	Moderate: too gravelly slope	Severe: large stones small stones droughty
311: Kinusta-----	Severe: slope depth to rock	Severe: slope	Severe: slope depth to rock	Severe: slope	Severe: slope	Moderate: depth to rock low strength slope	Severe: slope	Severe: slope depth to rock

Table 10.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Unsurfaced roads	Fencing	Lawns and landscaping
311: Eslendo-----	Severe: slope depth to rock	Severe: slope	Severe: slope depth to rock	Severe: slope	Severe: slope	Severe: low strength	Severe: depth to rock slope	Severe: slope small stones depth to rock
Rock outcrop-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock slope	Severe: depth to rock slope	Severe: depth to rock
312: Blanding-----	Slight	Slight	Slight	Moderate: slope	Severe: low strength	Severe: low strength	Slight	Slight
313: Marjane-----	Severe: depth to rock	Moderate: depth to rock	Severe: depth to rock	Moderate: depth to rock	Moderate: depth to rock	Moderate: depth to rock low strength dusty	Slight	Moderate: depth to rock
Kitsili-----	Slight	Slight	Slight	Moderate: slope	Slight	Moderate: low strength	Slight	Slight
314: Mido-----	Severe: slope cutbanks cave	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Slight	Severe: slope	Severe: slope
315: Shoegame-----	Severe: cutbanks cave	Severe: flooding	Severe: flooding	Severe: flooding	Moderate: flooding large stones	Severe: large stones flooding	Severe: too gravelly too stony	Severe: large stones droughty
Riverwash-----	Severe: cutbanks cave	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding large stones	Severe: flooding too gravelly too stony	Severe: flooding small stones droughty
316: Millett-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Moderate: low strength large stones	Severe: too cobbly slope	Severe: large stones slope

Table 10.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Unsurfaced roads	Fencing	Lawns and landscaping
316: Strych-----	Severe: slope cutbanks cave	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: large stones	Severe: too stony slope	Severe: large stones slope small stones
Doakum-----	Moderate: slope	Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope	Severe: low strength	Moderate: slope	Moderate: slope
317: Toadlena-----	Severe: depth to rock	Moderate: shrink-swell slope depth to rock	Severe: depth to rock	Severe: slope	Severe: low strength	Severe: low strength	Severe: depth to rock slope	Severe: depth to rock
Eagleeye-----	Severe: slope depth to rock	Severe: shrink-swell slope	Severe: shrink-swell slope depth to rock	Severe: shrink-swell slope	Severe: low strength shrink-swell slope	Severe: low strength shrink-swell	Severe: shrink-swell slope	Severe: slope small stones depth to rock
318: Camino-----	Moderate: too clayey	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: shrink-swell slope	Severe: low strength	Severe: low strength	Slight	Severe: excess sodium
319: Skyhawk-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: low strength slope	Severe: low strength	Severe: slope	Severe: slope small stones
Lavellga-----	Moderate: large stones slope	Moderate: large stones slope	Moderate: large stones slope	Severe: slope	Moderate: large stones slope	Moderate: large stones dusty	Severe: too gravelly too cobbly	Severe: excess lime small stones droughty
320: Beclabito-----	Moderate: slope depth to rock	Moderate: slope	Moderate: slope depth to rock	Severe: slope	Moderate: slope	Moderate: low strength	Moderate: slope	Severe: excess sodium
Kinusta-----	Severe: slope depth to rock	Severe: slope	Severe: slope depth to rock	Severe: slope	Severe: slope	Moderate: depth to rock low strength	Severe: depth to rock slope	Severe: slope small stones depth to rock

Table 10.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Unsurfaced roads	Fencing	Lawns and landscaping
320: Badland-----	Severe: depth to rock	Moderate: slope depth to rock	Severe: depth to rock	Severe: slope	Moderate: slope depth to rock	Severe: low strength slope	Severe: depth to rock slope	Severe: depth to rock
400: Wetherill-----	Moderate: slope	Moderate: slope	Moderate: slope	Severe: slope	Severe: low strength	Severe: low strength	Slight	Moderate: slope
Atlatl-----	Severe: depth to rock	Moderate: depth to rock	Severe: depth to rock	Severe: slope	Moderate: frost action depth to rock	Moderate: depth to rock low strength dusty	Moderate: slope	Moderate: small stones depth to rock
401: Vessilla-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock slope	Severe: slope depth to rock
Rock outcrop-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock
402: Chazner-----	Moderate: cemented pan large stones slope	Moderate: large stones slope	Moderate: cemented pan large stones slope	Severe: slope	Moderate: frost action large stones slope	Moderate: large stones	Moderate: too gravelly slope	Severe: large stones
403: Chazner-----	Moderate: cemented pan large stones	Moderate: large stones	Moderate: cemented pan large stones	Moderate: large stones slope	Moderate: frost action large stones	Moderate: large stones	Moderate: too gravelly slope	Moderate: large stones small stones droughty
Katzine-----	Severe: slope cutbanks cave	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Moderate: slope large stones	Severe: too cobbly	Severe: large stones slope
404: Wetherill-----	Slight	Slight	Slight	Moderate: slope	Severe: low strength	Severe: low strength	Slight	Slight

Table 10.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Unsurfaced roads	Fencing	Lawns and landscaping
404: Tsezhin-----	Moderate: large stones slope	Moderate: large stones shrink-swell slope	Moderate: large stones shrink-swell slope	Severe: slope	Moderate: frost action shrink-swell slope	Severe: low strength	Severe: too gravelly too cobbly	Severe: large stones
406: Rock outcrop-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock slope	Severe: depth to rock slope	Severe: depth to rock
Nizhoni-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock slope	Severe: depth to rock
407: Iwela-----	Severe: slope cutbanks cave	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Moderate: low strength large stones dusty	Moderate: too gravelly too cobbly slope	Severe: large stones slope
Nomrah-----	Slight	Moderate: shrink-swell	Slight	Moderate: shrink-swell slope	Moderate: frost action shrink-swell	Severe: low strength	Moderate: Slope	Slight
Vosburg-----	Slight	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: frost action shrink-swell	Severe: low strength	Slight	Slight
408: Nizhoni-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock
Rock outcrop-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock
409: Chinlini-----	Slight	Slight	Slight	Moderate: slope	Severe: low strength	Severe: low strength	Slight	Slight

Table 10.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Unsurfaced roads	Fencing	Lawns and landscaping
410: Wetherill-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: low strength	Severe: slope	Severe: slope
411: Sojourn-----	Severe: slope depth to rock	Severe: slope	Severe: slope depth to rock	Severe: slope	Severe: slope	Severe: low strength	Severe: depth to rock slope	Severe: slope depth to rock
Badland-----	Severe: depth to rock	Moderate: slope depth to rock	Severe: depth to rock	Severe: slope	Moderate: slope depth to rock	Severe: low strength slope	Severe: depth to rock slope	Severe: depth to rock
412: Highdye-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: low strength depth to rock	Severe: depth to rock low strength	Severe: depth to rock	Severe: depth to rock
Menefee-----	Severe: slope depth to rock	Severe: slope	Severe: slope depth to rock	Severe: slope	Severe: low strength slope	Severe: low strength	Severe: depth to rock slope	Severe: slope depth to rock
413: Hozho-----	Severe: slope depth to rock	Severe: slope	Severe: slope depth to rock	Severe: slope	Severe: slope	Moderate: depth to rock slope	Severe: depth to rock slope	Severe: slope depth to rock
Quezcan-----	Severe: slope	Severe: shrink-swell slope	Severe: shrink-swell slope	Severe: shrink-swell slope	Severe: low strength shrink-swell slope	Severe: low strength shrink-swell	Severe: shrink-swell slope	Severe: large stones slope
Rock outcrop-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock slope	Severe: depth to rock slope	Severe: depth to rock
414: Arabrab-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock low strength	Severe: depth to rock slope	Severe: large stones small stones
Wetherill-----	Moderate: slope depth to rock	Moderate: slope	Moderate: slope depth to rock	Severe: slope	Moderate: frost action low strength slope	Severe: low strength	Moderate: slope	Moderate: slope

Table 10.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Unsurfaced roads	Fencing	Lawns and landscaping
415: Tsezhin-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: low strength	Severe: too gravelly too cobbly	Severe: large stones slope small stones
416: Arabrab-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: depth to rock low strength	Severe: depth to rock slope	Severe: large stones slope small stones
Rock outcrop-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: depth to rock slope	Severe: depth to rock slope	Severe: slope depth to rock
417: Wetherill-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: low strength slope	Severe: low strength	Severe: slope	Severe: slope
418: Menefee-----	Severe: slope depth to rock	Severe: slope	Severe: slope depth to rock	Severe: slope	Severe: low strength slope	Severe: low strength	Severe: depth to rock slope	Severe: slope small stones depth to rock
Espiritu-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: low strength large stones	Severe: slope	Severe: large stones slope droughty
Rock outcrop-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock slope	Severe: depth to rock slope	Severe: depth to rock
500: Whit-----	Slight	Slight	Slight	Slight	Severe: low strength	Severe: low strength	Slight	Slight
501: Escavada-----	Severe: cutbanks cave	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Moderate: flooding too sandy	Moderate: flooding droughty

Table 10.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Unsurfaced roads	Fencing	Lawns and landscaping
501: Riverwash-----	Severe: wetness cutbanks cave	Severe: flooding wetness	Severe: flooding wetness	Severe: flooding wetness	Severe: flooding wetness	Severe: wetness flooding	Severe: flooding wetness too sandy	Severe: flooding wetness droughty
502: Sogzie-----	Slight	Slight	Slight	Slight	Slight	Moderate: low strength	Moderate: too sandy	Slight
503: Claysprings-----	Severe: slope depth to rock	Severe: shrink-swell slope	Severe: shrink-swell slope depth to rock	Severe: shrink-swell slope	Severe: low strength shrink-swell slope	Severe: low strength shrink-swell	Severe: too clayey depth to rock shrink-swell slope	Severe: slope small stones depth to rock
Badland-----	Severe: depth to rock	Moderate: slope depth to rock	Severe: depth to rock	Severe: slope	Moderate: slope depth to rock	Severe: low strength shrink-swell	Severe: depth to rock slope	Severe: depth to rock
504: Tohona-----	Moderate: depth to rock	Severe: shrink-swell	Severe: shrink-swell	Severe: shrink-swell	Severe: low strength shrink-swell	Severe: low strength shrink-swell	Severe: shrink-swell	Severe: excess sodium small stones
Kimnoli-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock
Claysprings-----	Severe: slope depth to rock	Severe: shrink-swell slope	Severe: shrink-swell slope depth to rock	Severe: shrink-swell slope	Severe: low strength shrink-swell slope	Severe: low strength shrink-swell	Severe: too clayey shrink-swell slope	Severe: slope small stones depth to rock
505: Recapture-----	Severe: cutbanks cave	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: low strength shrink-swell	Severe: low strength	Moderate: excess salt	Severe: excess sodium

Table 10.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Unsurfaced roads	Fencing	Lawns and landscaping
505: Shorthair-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: excess sodium depth to rock
Aneth-----	Severe: cutbanks cave	Slight	Slight	Moderate: slope	Slight	Slight	Moderate: too sandy	Moderate: droughty
506: Blackston-----	Severe: cutbanks cave	Slight	Slight	Moderate: slope	Slight	Moderate: low strength dusty	Moderate: too gravelly	Moderate: droughty
Grazane-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: low strength	Severe: slope	Severe: large stones slope
507: Sheppard-----	Severe: cutbanks cave	Slight	Slight	Moderate: slope	Slight	Slight	Moderate: too sandy	Moderate: droughty
508: Shalet-----	Severe: slope depth to rock	Severe: slope	Severe: slope depth to rock	Severe: slope	Severe: slope	Severe: low strength	Severe: depth to rock slope	Severe: excess sodium slope depth to rock
Rock outcrop-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock slope	Severe: depth to rock slope	Severe: depth to rock
509: Trail-----	Severe: cutbanks cave	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding too sandy	Moderate: flooding droughty
510: Aneth-----	Severe: cutbanks cave	Slight	Slight	Slight	Slight	Slight	Moderate: too sandy	Moderate: droughty

Table 10.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Unsurfaced roads	Fencing	Lawns and landscaping
511: Redlands-----	Slight	Slight	Slight	Slight	Slight	Severe: low strength	Slight	Slight
512: Gotho-----	Slight	Severe: flooding	Severe: flooding	Severe: flooding	Moderate: flooding shrink-swell	Severe: low strength	Slight	Severe: excess sodium
513: Sogzie-----	Severe: cutbanks cave	Slight	Slight	Moderate: slope	Slight	Moderate: low strength	Moderate: too sandy	Slight
Aneth-----	Severe: cutbanks cave	Slight	Slight	Moderate: slope	Slight	Slight	Moderate: too sandy	Moderate: droughty
514: Aneth-----	Severe: cutbanks cave	Slight	Slight	Moderate: slope	Slight	Slight	Moderate: too sandy	Moderate: droughty
515: Piute-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: too sandy depth to rock slope	Severe: depth to rock
Bluechief-----	Severe: depth to rock	Moderate: depth to rock	Severe: depth to rock	Moderate: depth to rock	Moderate: depth to rock	Moderate: depth to rock	Moderate: depth to rock	Moderate: depth to rock
Rock outcrop-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock
516: Kaito-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: low strength slope dusty	Severe: slope	Severe: slope small stones
Claysprings-----	Severe: slope depth to rock	Severe: shrink-swell slope	Severe: shrink-swell slope depth to rock	Severe: shrink-swell slope	Severe: low strength shrink-swell slope	Severe: low strength shrink-swell	Severe: depth to rock shrink-swell slope	Severe: slope small stones depth to rock

Table 10.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Unsurfaced roads	Fencing	Lawns and landscaping
517: Moffat-----	Slight	Slight	Slight	Moderate: slope	Slight	Moderate: low strength	Moderate: slope	Slight
518: Tohatin-----	Severe: slope cutbanks cave	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Slight	Severe: slope	Severe: slope
Sheppard-----	Severe: slope cutbanks cave	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Slight	Severe: slope	Severe: slope
519: Shumbegay-----	Severe: cutbanks cave	Slight	Slight	Moderate: slope	Slight	Slight	Moderate: too sandy	Moderate: droughty
520: Rock outcrop-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock
Needle-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: too sandy depth to rock	Severe: depth to rock
521: Sandbench-----	Severe: cutbanks cave depth to rock	Moderate: depth to rock	Severe: depth to rock	Moderate: depth to rock	Moderate: depth to rock	Moderate: depth to rock	Moderate: too sandy	Moderate: depth to rock droughty
Sheppard-----	Severe: cutbanks cave	Slight	Slight	Moderate: slope	Slight	Slight	Moderate: too sandy	Moderate: droughty
522: Pennell-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock
523: Tyende-----	Moderate: depth to rock	Slight	Moderate: depth to rock	Slight	Slight	Moderate: low strength	Moderate: excess salt	Severe: excess sodium

Table 10.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Unsurfaced roads	Fencing	Lawns and landscaping
523: Aneth-----	Severe: cutbanks cave	Slight	Slight	Moderate: slope	Slight	Slight	Severe: slope	Moderate: droughty
Shumbegay-----	Severe: slope cutbanks cave	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Slight	Severe: too sandy slope	Severe: slope
524: Uzaneva-----	Moderate: too clayey	Severe: flooding	Severe: flooding	Severe: flooding	Severe: low strength	Severe: low strength shrink-swell	Severe: shrink-swell too clayey	Severe: excess sodium
525: Rock outcrop-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock slope	Severe: depth to rock slope	Severe: depth to rock
526: Sandbench-----	Severe: cutbanks cave depth to rock	Moderate: depth to rock	Severe: depth to rock	Moderate: slope depth to rock	Moderate: depth to rock	Moderate: depth to rock	Moderate: too sandy	Moderate: depth to rock droughty
Rock outcrop-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock
Piute, cool-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: too sandy depth to rock	Severe: depth to rock
527: Outpost-----	Severe: cutbanks cave	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding low strength	Severe: low strength flooding shrink-swell	Severe: shrink-swell	Moderate: flooding
528: Mack-----	Slight	Slight	Slight	Slight	Slight	Severe: low strength	Slight	Slight

Table 10.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Unsurfaced roads	Fencing	Lawns and landscaping
600:								
Kunz-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Moderate: low strength	Severe: slope	Severe: large stones slope
Yahmore-----	Slight	Slight	Slight	Moderate: slope	Moderate: frost action	Moderate: low strength	Moderate: slope	Slight
602:								
Bostwick-----	Slight	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: frost action low strength shrink-swell	Severe: low strength	Slight	Slight
Canburn-----	Severe: wetness cutbanks cave	Severe: flooding wetness	Severe: flooding wetness	Severe: flooding wetness	Severe: flooding frost action low strength	Severe: low strength wetness flooding	Moderate: flooding wetness	Moderate: flooding wetness
604:								
Yahmore-----	Moderate: slope	Moderate: slope	Moderate: slope	Severe: slope	Moderate: frost action slope	Moderate: low strength	Moderate: slope	Moderate: slope
Sandark-----	Severe: cutbanks cave	Moderate: slope	Moderate: slope	Severe: slope	Moderate: slope	Slight	Moderate: too sandy slope	Moderate: slope droughty
606:								
Narbona-----	Severe: slope cutbanks cave	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Moderate: slope large stones	Severe: too gravelly slope	Severe: large stones slope droughty
Deza-----	Severe: cutbanks cave	Moderate: slope	Moderate: slope wetness	Severe: slope	Moderate: slope	Slight	Severe: too sandy	Severe: droughty
608:								
Narbona-----	Severe: slope cutbanks cave	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: too gravelly slope	Severe: too gravelly slope	Severe: large stones slope droughty

Table 10.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Unsurfaced roads	Fencing	Lawns and landscaping
608: Zilditloi-----	Severe: cutbanks cave slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: too sandy slope	Severe: slope
610: Kunz-----	Moderate: slope	Moderate: slope	Moderate: slope	Severe: slope	Moderate: frost action slope	Severe: low strength	Moderate: slope	Moderate: slope
Xankey-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: low strength large stones	Severe: too stony slope	Severe: large stones slope
612: Xankey-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: low strength large stones	Severe: too stony slope	Severe: large stones slope
614: Kunz-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: low strength	Severe: slope	Severe: large stones slope
Tuntsa-----	Moderate: slope	Moderate: slope	Moderate: slope	Severe: slope	Moderate: frost action slope	Moderate: low strength	Slight	Moderate: slope
Yahmore-----	Moderate: slope	Moderate: slope	Moderate: slope	Severe: slope	Moderate: frost action slope	Moderate: low strength	Slight	Moderate: slope
616: Ligai-----	Severe: large stones slope depth to rock	Severe: large stones slope	Severe: large stones slope depth to rock	Severe: large stones slope	Severe: large stones slope	Moderate: depth to rock slope large stones	Severe: too gravelly too cobbly slope	Severe: large stones small stones droughty
Pastorpeak-----	Severe: large stones slope	Severe: large stones slope	Severe: large stones slope	Severe: large stones slope	Severe: large stones slope	Severe: slope large stones	Severe: too gravelly too cobbly slope	Severe: large stones slope

Table 10.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Unsurfaced roads	Fencing	Lawns and landscaping
616: Rock outcrop-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock slope	Severe: depth to rock slope	Severe: depth to rock
618: Zibetod-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: depth to rock large stones	Severe: depth to rock too cobbly slope	Severe: large stones small stones droughty
Bigpaw-----	Moderate: slope	Moderate: shrink-swell slope	Moderate: shrink-swell slope	Severe: slope	Severe: low strength	Severe: low strength	Moderate: slope	Moderate: slope
700: Akhoni-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock
Retaw-----	Severe: ponding cutbanks cave	Severe: ponding	Severe: ponding	Severe: ponding	Severe: low strength ponding	Severe: low strength wetness ponding	Severe: ponding wetness	Severe: excess humus ponding
702: Bikeyah-----	Severe: wetness	Moderate: slope wetness	Severe: wetness	Severe: slope	Moderate: frost action slope wetness	Severe: wetness	Moderate: slope	Moderate: slope
Berland-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock
704: Klizhin-----	Severe: slope cutbanks cave	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Moderate: low strength	Severe: slope	Severe: slope
Captom-----	Severe: slope cutbanks cave	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Moderate: slope large stones	Severe: slope	Severe: large stones slope

Table 10.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Unsurfaced roads	Fencing	Lawns and landscaping
706: Todacheene-----	Moderate: slope	Moderate: slope	Moderate: slope	Severe: slope	Moderate: frost action slope	Severe: low strength	Moderate: slope	Moderate: slope
Viewpoint-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock low strength	Severe: depth to rock	Severe: depth to rock
Owlspring-----	Severe: wetness	Severe: flooding	Severe: flooding wetness	Severe: flooding	Severe: flooding low strength	Severe: low strength wetness flooding	Severe: flooding	Severe: flooding
708: Tunitcha-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: low strength	Severe: slope	Severe: large stones slope small stones
Bangston-----	Severe: slope cutbanks cave	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Moderate: slope large stones	Severe: slope	Severe: slope
710: Akhoni-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock
Klizhin-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Moderate: low strength	Severe: slope	Severe: slope
712: Sonsela-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Moderate: slope large stones	Severe: too gravelly slope	Severe: slope

Table 11.--Sanitary Facilities

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable.)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
100: Werito-----	Severe: percs slowly excess gypsum depth to rock	Severe: excess gypsum depth to rock	Severe: depth to rock	Slight	Poor: hard to pack depth to rock
102: Blackston-----	Severe: poor filter	Severe: seepage	Severe: too sandy	Slight	Poor: small stones too sandy
Camac-----	Severe: percs slowly slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope	Poor: slope depth to rock
Rock outcrop-----	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Poor: depth to rock
105: Hamburn-----	Severe: flooding percs slowly	Slight	Severe: excess salt flooding	Severe: flooding	Good
107: Tocito-----	Moderate: flooding percs slowly	Moderate: seepage slope	Moderate: flooding	Moderate: flooding	Good
Gullied land-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Poor: slope
110: Brimhall-----	Severe: excess gypsum	Severe: seepage excess gypsum	Severe: depth to rock	Slight	Poor: thin layer
Benally-----	Severe: percs slowly	Moderate: seepage depth to rock	Severe: depth to rock	Slight	Fair: thin layer depth to rock
Genats-----	Severe: percs slowly slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope	Poor: hard to pack slope depth to rock
113: Gyptur-----	Severe: percs slowly excess gypsum	Severe: excess gypsum	Severe: excess salt depth to rock	Slight	Fair: thin layer depth to rock
115: Denazar-----	Severe: poor filter	Severe: seepage	Severe: depth to rock	Slight	Poor: thin layer

Table 11.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
115: Farb-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Slight	Poor: depth to rock
117: Badland-----	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Poor: depth to rock
Rock outcrop-----	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Poor: depth to rock
120: Nageezi-----	Slight	Severe: seepage	Slight	Slight	Good
Denazar-----	Severe: poor filter	Severe: seepage	Moderate: too sandy	Slight	Fair: too sandy
122: Blueflat-----	Severe: percs slowly excess gypsum depth to rock	Severe: excess gypsum depth to rock	Severe: depth to rock	Slight	Poor: depth to rock
Notal-----	Severe: percs slowly	Moderate: slope	Moderate: flooding	Moderate: flooding	Good
125: Kimbeto-----	Moderate: depth to rock	Severe: seepage	Severe: depth to rock	Slight	Fair: thin layer depth to rock
130: Badland-----	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Poor: depth to rock
Genats-----	Severe: percs slowly slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope	Poor: hard to pack slope depth to rock
133: Razito-----	Severe: poor filter	Severe: seepage	Severe: too sandy	Slight	Poor: too sandy
135: Farb-----	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Moderate: slope	Poor: depth to rock
Rock outcrop-----	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Poor: depth to rock
Badland-----	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Poor: depth to rock

Table 11.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
137: Persayo-----	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Moderate: slope	Poor: depth to rock
Cairn-----	Severe: excess gypsum	Severe: excess gypsum	Severe: large stones depth to rock	Slight	Poor: small stones
Patel-----	Severe: slope excess gypsum depth to rock	Severe: slope excess gypsum depth to rock	Severe: slope depth to rock	Severe: slope	Poor: slope depth to rock
140: Benally-----	Severe: percs slowly	Severe: seepage	Moderate: flooding	Moderate: flooding	Good
142: Bebevar-----	Severe: flooding wetness	Severe: seepage	Severe: flooding seepage wetness	Severe: flooding seepage	Poor: seepage small stones too sandy
Walrees-----	Severe: flooding percs slowly wetness	Severe: seepage wetness	Severe: flooding seepage wetness	Severe: flooding seepage wetness	Poor: seepage too sandy
145: Razito-----	Severe: poor filter	Severe: seepage	Severe: too sandy	Slight	Poor: too sandy
Huerfano-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Slight	Poor: depth to rock
147: Escavada-----	Moderate: flooding wetness	Severe: seepage	Severe: too sandy wetness	Moderate: flooding	Poor: seepage too sandy
150: Chipeta-----	Severe: slope depth to rock	Severe: slope depth to rock	---	Severe: slope	Poor: slope depth to rock
Badland-----	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Poor: depth to rock
Moncisco-----	Severe: slope poor filter	Severe: seepage slope	Severe: large stones slope	Severe: slope	Poor: seepage slope small stones
153: Green River-----	Severe: wetness	Severe: seepage	Severe: seepage wetness	Moderate: flooding wetness	Fair: thin layer

Table 11.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
153: Green River, saline----	Severe: wetness	Severe: seepage	Severe: seepage too sandy wetness	Moderate: flooding wetness	Poor: excess salt too sandy
155: Mesa-----	Moderate: percs slowly	Severe: seepage	Moderate: large stones	Slight	Poor: small stones
157: Werjo, saline-----	Severe: percs slowly wetness	Moderate: wetness	Severe: excess salt wetness	Moderate: flooding wetness	Poor: excess salt
Werjo-----	Severe: percs slowly wetness	Moderate: wetness	Severe: wetness	Moderate: flooding wetness	Fair: too clayey
160: Notal-----	Severe: percs slowly	Slight	Moderate: flooding	Moderate: flooding	Good
Escavada-----	Severe: flooding	Severe: flooding	Severe: flooding too sandy wetness	Severe: flooding	Poor: too sandy
Riverwash-----	Severe: flooding wetness poor filter	Severe: flooding seepage wetness	Severe: flooding seepage wetness	Severe: flooding seepage wetness	Poor: seepage too sandy wetness
163: Werlog-----	Severe: percs slowly wetness	Severe: wetness	Severe: excess salt too clayey wetness	Severe: wetness	Poor: too clayey
165: Jeddito-----	Severe: poor filter	Severe: seepage	Severe: too sandy	Moderate: flooding	Poor: too sandy
Escavada-----	Severe: flooding	Severe: flooding	Severe: flooding too sandy wetness	Severe: flooding	Poor: too sandy
167: Hoskay-----	Severe: percs slowly excess gypsum	Severe: excess gypsum	Slight	Slight	Poor: hard to pack
Patel-----	Severe: slope excess gypsum depth to rock	Severe: slope excess gypsum depth to rock	Severe: slope depth to rock	Severe: slope	Poor: slope depth to rock

Table 11.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
167: Badland-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Poor: slope depth to rock
170: Notal-----	Severe: percs slowly	Slight	Moderate: flooding	Moderate: flooding	Good
173: Shiprock-----	Slight	Severe: seepage	Slight	Slight	Good
175: Suwanee-----	Severe: flooding percs slowly	Severe: flooding	Severe: flooding	Severe: flooding	Good
177: Notal-----	Severe: percs slowly	Moderate: slope	Slight	Slight	Good
180: Kimbeto-----	Moderate: depth to rock	Severe: seepage	Severe: depth to rock	Slight	Fair: thin layer depth to rock
Huerfano-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Slight	Poor: depth to rock
183: Gyptur-----	Severe: excess gypsum	Severe: slope excess gypsum	Severe: excess salt	Moderate: slope	Fair: slope
190: Jeddito-----	Severe: percs slowly	Severe: seepage	Moderate: flooding too sandy	Moderate: flooding	Fair: too sandy
195: Tewa-----	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope	Fair: slope
200: Tocito-----	Severe: percs slowly	Moderate: seepage slope	Slight	Slight	Good
205: Shiprock-----	Slight	Severe: seepage	Slight	Slight	Good
Farb-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Slight	Poor: depth to rock
210: Mack-----	Slight	Severe: seepage	Slight	Slight	Good

Table 11.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
210: Mesa-----	Moderate: percs slowly	Severe: seepage	Moderate: large stones	Slight	Poor: small stones
215: Persayo-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Slight	Poor: depth to rock
Fordbutte-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Slight	Poor: depth to rock
220: Chinde-----	Severe: percs slowly excess gypsum	Severe: excess gypsum	Severe: excess salt	Slight	Good
230: Ravola-----	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Good
235: Wingrock-----	Severe: poor filter	Severe: seepage slope	Moderate: slope too sandy	Moderate: slope	Fair: slope small stones too sandy
Rock outcrop-----	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Poor: depth to rock
240: Nageezi-----	Slight	Severe: seepage	Slight	Slight	Good
245: Tsebitai-----	Slight	Moderate: seepage slope	Slight	Slight	Good
250: Littlehat-----	Severe: depth to rock	Severe: slope depth to rock	Severe: excess salt depth to rock	Moderate: slope	Poor: depth to rock
Persayo-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Slight	Poor: depth to rock
Nataani-----	Severe: excess gypsum depth to rock	Severe: excess gypsum depth to rock	Severe: depth to rock	Slight	Poor: depth to rock
255: Benally-----	Severe: percs slowly	Moderate: seepage slope	Severe: excess salt	Slight	Good

Table 11.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
260:					
Littlehat-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: excess salt slope depth to rock	Severe: slope	Poor: slope depth to rock
Persayo-----	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Moderate: slope	Poor: depth to rock
Badland-----	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Poor: depth to rock
265:					
Camac-----	Severe: percs slowly slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope	Poor: slope depth to rock
Kimbeto-----	Moderate: percs slowly	Moderate: seepage slope	Slight	Slight	Good
Badland-----	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Poor: depth to rock
270:					
Fruitland-----	Slight	Severe: seepage	Slight	Slight	Good
275:					
Razito-----	Severe: poor filter	Severe: seepage	Severe: too sandy	Slight	Poor: too sandy
285:					
Water-----	---	---	---	---	---
Riverwash-----	Severe: flooding wetness poor filter	Severe: flooding seepage wetness	Severe: flooding seepage wetness	Severe: flooding seepage wetness	Poor: small stones too sandy wetness
290:					
Mesa-----	Severe: wetness poor filter	Severe: seepage	Severe: too sandy wetness	Moderate: wetness	Poor: seepage small stones too sandy
295:					
Mesa-----	Severe: wetness poor filter	Severe: seepage	Severe: too sandy wetness	Moderate: wetness	Poor: seepage small stones too sandy
300:					
Farview-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Slight	Poor: depth to rock

Table 11.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
300: Rock outcrop-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Poor: slope depth to rock
301: Farview-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Slight	Poor: depth to rock
Sanostee-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Slight	Poor: depth to rock
Rock outcrop-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Poor: slope depth to rock
302: Doakum-----	Moderate: depth to rock	Moderate: seepage slope depth to rock	Severe: depth to rock	Slight	Fair: thin layer depth to rock
303: Snapill-----	Moderate: percs slowly depth to rock	Moderate: seepage slope depth to rock	Severe: depth to rock	Slight	Fair: thin layer depth to rock
304: Farview-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Slight	Poor: depth to rock
Beclabito-----	Severe: percs slowly	Moderate: seepage slope depth to rock	Severe: depth to rock	Slight	Fair: thin layer depth to rock
Rock outcrop-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Poor: slope depth to rock
305: Strych-----	Severe: slope	Severe: large stones seepage slope	Severe: slope	Severe: slope	Poor: slope small stones
Eagleeye-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope	Poor: hard to pack slope depth to rock
Rock outcrop-----	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Poor: depth to rock
306: Arches-----	Severe: depth to rock	Severe: seepage slope depth to rock	Severe: depth to rock	Moderate: slope	Poor: depth to rock

Table 11.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
306: Kitsili-----	Slight	Severe: seepage	Slight	Slight	Good
Mido-----	Severe: poor filter	Severe: seepage slope	Severe: too sandy	Slight	Poor: too sandy
307: Bodot-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope	Poor: hard to pack slope depth to rock
Beclabito-----	Severe: percs slowly slope	Severe: slope	Severe: slope depth to rock	Severe: slope	Poor: hard to pack slope
Rock outcrop-----	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Poor: depth to rock
308: Mcelmo-----	Severe: percs slowly excess gypsum	Severe: slope excess gypsum	Severe: depth to rock	Moderate: slope	Poor: hard to pack
Farview-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Slight	Poor: depth to rock
309: Rock outcrop-----	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Poor: depth to rock
Rizno-----	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Moderate: slope	Poor: depth to rock
310: Millett-----	Slight	Severe: seepage	Moderate: large stones	Slight	Poor: small stones
Blanding-----	Moderate: percs slowly	Moderate: seepage slope	Slight	Slight	Good
Strych-----	Severe: slope	Severe: large stones seepage slope	Severe: slope	Severe: slope	Poor: slope small stones
311: Kinusta-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope	Poor: slope depth to rock

Table 11.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
311: Eslando-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope	Poor: slope depth to rock
Rock outcrop-----	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Poor: depth to rock
312: Blanding-----	Moderate: percs slowly	Moderate: seepage slope	Slight	Slight	Good
313: Marjane-----	Severe: depth to rock	Severe: seepage depth to rock	Severe: depth to rock	Slight	Poor: depth to rock
Kitsili-----	Slight	Severe: seepage	Slight	Slight	Good
314: Mido-----	Severe: slope poor filter	Severe: seepage slope	Severe: slope too sandy	Severe: slope	Poor: slope too sandy
315: Shoegame-----	Severe: poor filter	Severe: large stones seepage	Severe: large stones too sandy	Moderate: flooding	Poor: large stones seepage too sandy
Riverwash-----	Severe: flooding poor filter	Severe: flooding large stones seepage	Severe: flooding seepage too sandy	Severe: flooding seepage	Poor: seepage small stones too sandy
316: Millett-----	Severe: slope	Severe: large stones seepage slope	Severe: large stones slope	Severe: slope	Poor: slope small stones
Strych-----	Severe: slope	Severe: large stones seepage slope	Severe: slope	Severe: slope	Poor: slope small stones
Doakum-----	Moderate: slope	Severe: seepage slope	Moderate: slope	Moderate: slope	Fair: slope
317: Toadlena-----	Severe: excess gypsum depth to rock	Severe: slope excess gypsum depth to rock	Severe: depth to rock	Moderate: slope	Poor: depth to rock

Table 11.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
317: Eagleeye-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope	Poor: hard to pack slope depth to rock
318: Camino-----	Severe: percs slowly	Moderate: slope	Slight	Slight	Good
319: Skyhawk-----	Severe: percs slowly slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope	Poor: slope depth to rock
Lavellga-----	Moderate: large stones slope	Severe: seepage slope	Severe: large stones	Moderate: slope	Poor: small stones
320: Beclabito-----	Severe: depth to rock	Severe: seepage slope depth to rock	Severe: depth to rock	Moderate: slope	Poor: depth to rock
Kinusta-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope	Poor: slope depth to rock
Badland-----	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Poor: depth to rock
400: Wetherill-----	Moderate: percs slowly slope	Severe: slope	Moderate: slope	Moderate: slope	Fair: slope
Atlatl-----	Severe: depth to rock	Severe: seepage slope depth to rock	Severe: depth to rock	Moderate: slope	Poor: depth to rock
401: Vessilla-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: seepage slope depth to rock	Severe: slope depth to rock	Poor: slope depth to rock
Rock outcrop-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Poor: slope depth to rock
402: Chazner-----	Severe: cemented pan	Severe: cemented pan seepage slope	Severe: seepage	Severe: cemented pan seepage	Poor: cemented pan large stones

Table 11.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
403: Chazner-----	Severe: cemented pan	Severe: cemented pan seepage slope	Severe: seepage	Severe: cemented pan seepage	Poor: cemented pan large stones
Katzine-----	Severe: slope	Severe: large stones seepage slope	Severe: large stones slope	Severe: slope	Poor: slope small stones
404: Wetherill-----	Moderate: percs slowly	Moderate: seepage slope	Slight	Slight	Good
Tsezhin-----	Severe: percs slowly	Severe: slope	Moderate: large stones slope	Moderate: slope	Poor: small stones
406: Rock outcrop-----	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Poor: depth to rock
Nizhoni-----	Severe: depth to rock	Severe: slope depth to rock	Severe: seepage depth to rock	Severe: depth to rock	Poor: depth to rock
407: Iwela-----	Severe: slope	Severe: seepage slope	Severe: slope	Severe: slope	Poor: slope
Nomrah-----	Moderate: percs slowly	Severe: seepage	Slight	Slight	Good
Vosburg-----	Moderate: percs slowly	Moderate: seepage slope	Moderate: too clayey	Slight	Fair: too clayey
408: Nizhoni-----	Severe: depth to rock	Severe: slope depth to rock	Severe: seepage depth to rock	Severe: depth to rock	Poor: depth to rock
Rock outcrop-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Poor: slope depth to rock
409: Chinlini-----	Moderate: cemented pan percs slowly	Severe: seepage	Severe: seepage	Severe: seepage	Fair: cemented pan thin layer
410: Wetherill-----	Severe: slope	Severe: seepage slope	Severe: slope	Severe: slope	Poor: slope

Table 11.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
411: Sojourn-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Poor: slope depth to rock
Badland-----	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Poor: depth to rock
412: Highdye-----	Severe: depth to rock	Severe: slope depth to rock	Severe: too clayey depth to rock	Severe: depth to rock	Poor: hard to pack too clayey depth to rock
Menefee-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Poor: slope depth to rock
413: Hozho-----	Severe: slope depth to rock	Severe: seepage slope depth to rock	Severe: seepage slope depth to rock	Severe: slope depth to rock	Poor: seepage too sandy depth to rock
Quezcan-----	Severe: percs slowly slope depth to rock	Severe: slope depth to rock	Severe: slope too clayey depth to rock	Severe: slope depth to rock	Poor: hard to pack too clayey depth to rock
Rock outcrop-----	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Poor: depth to rock
414: Arabrab-----	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Poor: small stones depth to rock
Wetherill-----	Moderate: percs slowly slope depth to rock	Severe: slope	Severe: depth to rock	Moderate: slope	Fair: slope thin layer depth to rock
415: Tsezhin-----	Severe: slope	Severe: slope	Severe: large stones slope	Severe: slope	Poor: slope small stones
416: Arabrab-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Poor: slope small stones depth to rock
Rock outcrop-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Poor: slope depth to rock

Table 11.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
417: Wetherill-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Poor: slope
418: Menefee-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Poor: slope depth to rock
Espiritu-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Poor: slope small stones
Rock outcrop-----	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Poor: depth to rock
500: Whit-----	Moderate: percs slowly	Moderate: seepage slope	Slight	Slight	Good
501: Escavada-----	Severe: flooding	Severe: flooding	Severe: flooding too sandy wetness	Severe: flooding	Poor: too sandy
Riverwash-----	Severe: flooding wetness poor filter	Severe: flooding seepage wetness	Severe: flooding seepage wetness	Severe: flooding seepage wetness	Poor: seepage too sandy wetness
502: Sogzie-----	Slight	Severe: seepage	Slight	Slight	Good
503: Claysprings-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope	Poor: hard to pack slope depth to rock
Badland-----	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Poor: depth to rock
504: Tohona-----	Severe: percs slowly excess gypsum depth to rock	Severe: slope excess gypsum depth to rock	Severe: depth to rock	Slight	Poor: hard to pack depth to rock
Kimmoli-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Slight	Poor: depth to rock
Claysprings-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope	Poor: hard to pack slope depth to rock

Table 11.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
505: Recapture-----	Severe: percs slowly excess gypsum	Severe: seepage slope excess gypsum	Slight	Slight	Good
Shorthair-----	Severe: depth to rock	Severe: seepage depth to rock	Severe: depth to rock	Slight	Poor: depth to rock
Aneth-----	Severe: poor filter	Severe: seepage	Moderate: too sandy	Slight	Fair: too sandy
506: Blackston-----	Severe: poor filter	Severe: seepage	Moderate: too sandy	Slight	Poor: seepage small stones
Grazane-----	Severe: percs slowly slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope	Poor: slope depth to rock
507: Sheppard-----	Severe: poor filter	Severe: seepage	Severe: too sandy	Slight	Poor: too sandy
508: Shalet-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope	Poor: slope depth to rock
Rock outcrop-----	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Poor: depth to rock
509: Trail-----	Severe: flooding	Severe: seepage	Severe: flooding too sandy	Severe: flooding	Poor: too sandy
510: Aneth-----	Severe: poor filter	Severe: seepage	Moderate: too sandy	Slight	Fair: too sandy
511: Redlands-----	Moderate: percs slowly	Severe: seepage	Slight	Slight	Good
512: Gotho-----	Severe: percs slowly	Slight	Moderate: flooding	Moderate: flooding	Good
513: Sogzie-----	Severe: poor filter	Severe: seepage	Severe: depth to rock	Slight	Fair: thin layer depth to rock
Aneth-----	Severe: poor filter	Severe: seepage	Moderate: too sandy	Slight	Fair: too sandy

Table 11.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
514: Aneth-----	Severe: poor filter	Severe: seepage	Moderate: too sandy	Slight	Fair: too sandy
515: Piute-----	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Moderate: slope	Poor: depth to rock
Bluechief-----	Severe: depth to rock	Severe: seepage depth to rock	Severe: depth to rock	Slight	Poor: depth to rock
Rock outcrop-----	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Poor: depth to rock
516: Kaito-----	Severe: slope	Severe: seepage slope	Severe: seepage slope depth to rock	Severe: seepage slope	Poor: slope
Claysprings-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope	Poor: hard to pack slope depth to rock
517: Moffat-----	Slight	Severe: seepage	Slight	Slight	Good
518: Tohatin-----	Severe: slope poor filter	Severe: seepage slope	Severe: slope too sandy	Severe: slope	Poor: slope too sandy
Sheppard-----	Severe: slope poor filter	Severe: seepage slope	Severe: slope too sandy	Severe: slope	Poor: slope too sandy
519: Shumbegay-----	Slight	Severe: seepage	Severe: too sandy	Slight	Poor: too sandy
520: Rock outcrop-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Poor: slope depth to rock
Needle-----	Severe: depth to rock	Severe: seepage slope depth to rock	Severe: too sandy depth to rock	Moderate: slope	Poor: too sandy depth to rock
521: Sandbench-----	Severe: poor filter depth to rock	Severe: seepage depth to rock	Severe: too sandy depth to rock	Slight	Poor: too sandy depth to rock

Table 11.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
521: Sheppard-----	Severe: poor filter	Severe: seepage	Severe: too sandy	Slight	Poor: too sandy
522: Pennell-----	Severe: depth to rock	Severe: seepage depth to rock	Severe: depth to rock	Slight	Poor: depth to rock
523: Tyende-----	Severe: depth to rock	Severe: seepage depth to rock	Severe: excess salt depth to rock	Slight	Poor: depth to rock
Aneth-----	Severe: poor filter	Severe: seepage	Moderate: too sandy	Slight	Fair: too sandy
Shumbegay-----	Severe: slope	Severe: seepage slope	Severe: slope too sandy	Severe: slope	Poor: slope too sandy
524: Uzaneva-----	Severe: percs slowly	Slight	Moderate: flooding	Moderate: flooding	Good
525: Rock outcrop-----	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Poor: depth to rock
526: Sandbench-----	Severe: poor filter depth to rock	Severe: seepage depth to rock	Severe: too sandy depth to rock	Slight	Poor: too sandy depth to rock
Rock outcrop-----	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Poor: depth to rock
Piute, cool-----	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Slight	Poor: depth to rock
527: Outpost-----	Severe: flooding percs slowly	Severe: flooding seepage	Severe: flooding	Severe: flooding	Poor: hard to pack
528: Mack-----	Moderate: percs slowly	Severe: seepage	Slight	Slight	Good
600: Kunz-----	Severe: slope	Severe: seepage slope	Severe: seepage slope	Severe: seepage slope	Poor: slope
Yahmore-----	Slight	Severe: seepage	Slight	Severe: seepage	Good

Table 11.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
602: Bostwick-----	Moderate: percs slowly	Severe: seepage	Slight	Slight	Good
Canburn-----	Severe: flooding percs slowly wetness	Severe: flooding seepage wetness	Severe: flooding wetness	Severe: flooding seepage wetness	Poor: wetness
604: Yahmore-----	Moderate: slope	Severe: seepage slope	Moderate: slope	Severe: seepage	Fair: slope
Sandark-----	Severe: poor filter	Severe: seepage slope	Severe: seepage too sandy	Severe: seepage	Poor: too sandy
606: Narbona-----	Severe: slope	Severe: seepage slope	Severe: slope	Severe: seepage slope	Poor: slope small stones
Deza-----	Severe: poor filter	Severe: seepage slope	Severe: seepage too sandy wetness	Severe: seepage	Poor: too sandy
608: Narbona-----	Severe: slope	Severe: seepage slope	Severe: slope	Severe: seepage slope	Poor: slope small stones
Zilditloi-----	Severe: poor filter slope	Severe: seepage slope	Severe: seepage slope too sandy	Severe: seepage slope	Poor too sandy slope
610: Kunz-----	Severe: percs slowly	Severe: slope	Moderate: slope too clayey	Moderate: slope	Fair: slope too clayey
Xankey-----	Severe: slope	Severe: large stones seepage slope	Severe: seepage slope	Severe: seepage slope	Poor: slope
612: Xankey-----	Severe: slope	Severe: large stones seepage slope	Severe: seepage slope	Severe: seepage slope	Poor: slope
614: Kunz-----	Severe: percs slowly slope	Severe: slope	Severe: slope	Severe: slope	Poor: slope

Table 11.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
614:					
Tuntsa-----	Moderate: slope	Severe: seepage slope	Severe: seepage	Severe: seepage	Fair: slope
Yahmore-----	Moderate: slope	Severe: seepage slope	Moderate: slope	Severe: seepage	Fair: slope
616:					
Ligai-----	Severe: large stones slope depth to rock	Severe: large stones slope depth to rock	Severe: large stones slope depth to rock	Severe: slope depth to rock	Poor: slope small stones depth to rock
Pastorpeak-----	Severe: large stones slope	Severe: large stones slope	Severe: large stones seepage slope	Severe: slope	Poor: large stones slope
Rock outcrop-----	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Poor: depth to rock
618:					
Zibetod-----	Severe: slope depth to rock	Severe: seepage slope depth to rock	Severe: seepage slope depth to rock	Severe: slope depth to rock	Poor: large stones slope depth to rock
Bigpaw-----	Moderate: percs slowly slope	Severe: slope	Moderate: slope	Moderate: slope	Fair: slope
700:					
Akhoni-----	Severe: depth to rock	Severe: seepage slope depth to rock	Severe: seepage depth to rock	Severe: depth to rock	Poor: depth to rock
Retaw-----	Severe: percs slowly ponding	Severe: ponding	Severe: ponding	Severe: ponding	Poor: ponding
702:					
Bikeyah-----	Severe: wetness	Severe: slope wetness	Severe: wetness	Severe: wetness	Fair: slope wetness
Berland-----	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Poor: depth to rock
704:					
Klizhin-----	Severe: slope	Severe: seepage slope	Severe: seepage slope	Severe: seepage slope	Poor: slope

Table 11.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
704: Captom-----	Severe: slope poor filter	Severe: seepage slope	Severe: seepage slope depth to rock	Severe: seepage slope	Poor: slope
706: Todacheene-----	Moderate: slope	Severe: seepage slope	Severe: seepage	Severe: seepage	Poor: small stones
Viewpoint-----	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Poor: small stones depth to rock
Owlspring-----	Severe: flooding percs slowly wetness	Severe: seepage	Severe: flooding seepage wetness	Severe: flooding wetness	Fair: wetness
708: Tunitcha-----	Severe: slope	Severe: seepage slope	Severe: seepage slope depth to rock	Severe: seepage slope	Poor: slope
Bangston-----	Severe: slope poor filter	Severe: seepage slope	Severe: seepage slope	Severe: seepage slope	Poor: slope
710: Akhoni-----	Severe: depth to rock	Severe: seepage slope depth to rock	Severe: seepage depth to rock	Severe: depth to rock	Poor: depth to rock
Klizhin-----	Severe: slope	Severe: seepage slope	Severe: seepage slope depth to rock	Severe: seepage slope	Poor: slope
712: Sonsela-----	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Poor: slope small stones
Washpass-----	Severe: slope	Severe: seepage slope	Severe: seepage slope	Severe: seepage slope	Poor: slope
Viewpoint-----	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Poor: slope small stones depth to rock
W: Water-----	---	---	---	---	---

Table 12.--Construction Materials

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable.)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
100: Werito-----	Poor: low strength depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium too clayey
102: Blackston-----	Good	Improbable: excess fines	Improbable: excess fines	Poor: area reclaim small stones
Camac-----	Poor: low strength slope depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: slope small stones
Rock outcrop-----	Poor: depth to rock	Improbable: depth to rock	Improbable: depth to rock	Poor: depth to rock
105: Hamburn-----	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium excess salt
107: Tocito-----	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Fair: excess salt
Gullied land-----	Poor: low strength slope	Improbable: excess fines	Improbable: excess fines	Poor: slope
110: Brimhall-----	Poor: thin layer excess gypsum	Improbable: excess fines	Improbable: excess fines	Fair: small stones thin layer
Benally-----	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium excess salt
Genats-----	Poor: low strength slope depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: excess salt slope too clayey
113: Gyptur-----	Poor: low strength excess gypsum	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium excess salt
115: Denazar-----	Fair: thin layer depth to rock	Improbable: excess fines	Improbable: excess fines	Fair: small stones thin layer too sandy
Farb-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: depth to rock

Table 12.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
117: Badland-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: depth to rock
Rock outcrop-----	Poor: depth to rock	Improbable: depth to rock	Improbable: depth to rock	Poor: depth to rock
120: Nageezi-----	Good	Improbable: excess fines	Improbable: excess fines	Fair: small stones
Denazar-----	Good	Improbable: excess fines	Improbable: excess fines	Fair: small stones too sandy
122: Blueflat-----	Poor: low strength depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium excess salt too clayey
Notal-----	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium excess salt too clayey
125: Kimbeto-----	Fair: thin layer depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium excess salt
130: Badland-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: depth to rock
Genats-----	Poor: low strength slope depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: excess salt slope too clayey
133: Razito-----	Good	Improbable: excess fines	Improbable: excess fines	Poor: too sandy
135: Farb-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: small stones depth to rock
Rock outcrop-----	Poor: depth to rock	Improbable: depth to rock	Improbable: depth to rock	Poor: depth to rock
Badland-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: depth to rock
137: Persayo-----	Poor: low strength depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: excess salt depth to rock

Table 12.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
137: Cairn-----	Poor: thin layer excess gypsum	Improbable: large stones excess fines	Improbable: large stones excess fines	Poor: area reclaim small stones
Patel-----	Poor: low strength depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium excess salt too clayey
140: Benally-----	Good	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium
142: Bebeever-----	Good	Probable	Probable	Poor: area reclaim small stones too sandy
Walrees-----	Fair: wetness	Probable	Probable	Fair: small stones too clayey too sandy
145: Razito-----	Good	Improbable: excess fines	Improbable: excess fines	Poor: too sandy
Huerfano-----	Poor: low strength depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium depth to rock
147: Escavada-----	Good	Probable	Improbable: too sandy	Improbable: too sandy
150: Chipeta-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: small stones too clayey depth to rock
Badland-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: depth to rock
Moncisco-----	Poor: slope	Improbable: small stones	Probable	Poor: area reclaim slope small stones
153: Green River-----	Good	Improbable: excess fines	Improbable: excess fines	Fair: excess salt
Green River, saline----	Good	Improbable: excess fines	Improbable: excess fines	Poor: excess salt too sandy

Table 12.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
155: Mesa-----	Good	Improbable: excess fines	Improbable: excess fines	Poor: area reclaim small stones
157: Werjo, saline-----	Fair: low strength	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium excess salt
Werjo-----	Fair: low strength	Improbable: excess fines	Improbable: excess fines	Fair: excess salt too clayey
160: Notal-----	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium excess salt too clayey
Escavada-----	Good	Improbable: excess fines	Improbable: excess fines	Poor: too sandy
Riverwash-----	Poor: wetness	Probable	Improbable: too sandy	Poor: small stones too sandy wetness
163: Werlog-----	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium too clayey
165: Jeddito-----	Good	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium
Escavada-----	Good	Improbable: excess fines	Improbable: excess fines	Poor: too sandy
167: Hoskay-----	Poor: low strength shrink-swell excess gypsum	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium excess salt too clayey
Patel-----	Poor: low strength depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium excess salt too clayey
Badland-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: slope depth to rock
170: Notal-----	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium excess salt too clayey

Table 12.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
173: Shiprock-----	Good	Improbable: excess fines	Improbable: excess fines	Good
175: Suwanee-----	Fair: low strength shrink-swell	Improbable: excess fines	Improbable: excess fines	Fair: small stones too clayey
177: Notal-----	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium excess salt too clayey
180: Kimbeto-----	Fair: thin layer depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium excess salt
Huerfano-----	Poor: low strength depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium depth to rock
183: Gyptur-----	Fair: low strength	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium excess salt
190: Jeddito-----	Good	Improbable: excess fines	Improbable: excess fines	Fair: small stones too clayey too sandy
195: Tewa-----	Good	Improbable: excess fines	Improbable: excess fines	Fair: slope small stones
200: Tocito-----	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Fair: excess salt
205: Shiprock-----	Good	Improbable: excess fines	Improbable: excess fines	Good
Farb-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: depth to rock
210: Mack-----	Good	Improbable: excess fines	Improbable: excess fines	Fair: small stones too clayey
Mesa-----	Good	Improbable: excess fines	Improbable: excess fines	Poor: area reclaim small stones

Table 12.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
215: Persayo-----	Poor: low strength depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: excess salt depth to rock
Fordbutte-----	Poor: low strength depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium
220: Chinde-----	Poor: low strength shrink-swell	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium excess salt too clayey
230: Ravola-----	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Good
235: Wingrock-----	Good	Improbable: excess fines	Improbable: excess fines	Poor: small stones
Rock outcrop-----	Poor: depth to rock	Improbable: depth to rock	Improbable: depth to rock	Poor: depth to rock
240: Nageezi-----	Good	Improbable: excess fines	Improbable: excess fines	Fair: small stones
245: Tsebitai-----	Good	Improbable: excess fines	Improbable: excess fines	Fair: small stones
250: Littlehat-----	Poor: low strength depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium excess salt
Persayo-----	Poor: low strength depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: excess salt depth to rock
Nataani-----	Poor: excess gypsum depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: excess salt
255: Benally-----	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium excess salt
260: Littlehat-----	Poor: low strength depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium excess salt slope
Persayo-----	Poor: low strength depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: excess salt depth to rock

Table 12.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
260: Badland-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: depth to rock
265: Camac-----	Poor: low strength slope depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: slope small stones
Kimбето-----	Good	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium excess salt
Badland-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: depth to rock
270: Fruitland-----	Good	Improbable: excess fines	Improbable: excess fines	Fair: small stones
275: Razito-----	Good	Improbable: excess fines	Improbable: excess fines	Poor: too sandy
285: Water-----	---	---	---	---
Riverwash-----	Poor: wetness	Probable	Probable	Poor: area reclaim small stones too sandy
290: Mesa-----	Good	Probable	Probable	Poor: area reclaim small stones
295: Mesa-----	Good	Probable	Probable	Poor: area reclaim small stones
300: Farview-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: small stones depth to rock
Rock outcrop-----	Poor: depth to rock	Improbable: depth to rock	Improbable: depth to rock	Poor: slope depth to rock
301: Farview-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: small stones depth to rock
Sanostee-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Fair: small stones too clayey depth to rock

Table 12.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
301: Rock outcrop-----	Poor: depth to rock	Improbable: depth to rock	Improbable: depth to rock	Poor: slope depth to rock
302: Doakum-----	Fair: thin layer depth to rock	Improbable: excess fines	Improbable: excess fines	Fair: excess salt too clayey
303: Snapill-----	Fair: low strength thin layer depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium
304: Farview-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: small stones depth to rock
Beclabito-----	Fair: thin layer depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium
Rock outcrop-----	Poor: depth to rock	Improbable: depth to rock	Improbable: depth to rock	Poor: slope depth to rock
305: Strych-----	Poor: slope	Improbable: excess fines	Improbable: excess fines	Poor: area reclaim slope small stones
Eagleys-----	Poor: low strength shrink-swell depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: excess salt too clayey depth to rock
Rock outcrop-----	Poor: depth to rock	Improbable: depth to rock	Improbable: depth to rock	Poor: depth to rock
306: Arches-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: depth to rock
Kitsili-----	Good	Improbable: excess fines	Improbable: excess fines	Good
Mido-----	Good	Improbable: excess fines	Improbable: excess fines	Poor: too sandy
307: Bodot-----	Poor: low strength shrink-swell depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: slope too clayey

Table 12.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
307: Beclabito-----	Poor: low strength slope	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium slope small stones
Rock outcrop-----	Poor: depth to rock	Improbable: depth to rock	Improbable: depth to rock	Poor: depth to rock
308: Mcelmo-----	Poor: shrink-swell	Improbable: excess fines	Improbable: excess fines	Poor: excess salt small stones too clayey
Farview-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: small stones depth to rock
309: Rock outcrop-----	Poor: depth to rock	Improbable: depth to rock	Improbable: depth to rock	Poor: depth to rock
Rizno-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: depth to rock
310: Millett-----	Good	Improbable: excess fines	Improbable: excess fines	Poor: area reclaim small stones
Blanding-----	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Fair: too clayey
Strych-----	Poor: slope	Improbable: excess fines	Improbable: excess fines	Poor: area reclaim slope small stones
311: Kinusta-----	Poor: slope depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: slope depth to rock
Eslendo-----	Poor: slope depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: slope depth to rock
Rock outcrop-----	Poor: depth to rock	Improbable: depth to rock	Improbable: depth to rock	Poor: depth to rock
312: Blanding-----	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Fair: too clayey
313: Marjane-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Fair: thin layer depth to rock
Kitsili-----	Good	Improbable: excess fines	Improbable: excess fines	Good

Table 12.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
314: Mido-----	Poor: slope	Improbable: excess fines	Improbable: excess fines	Poor: slope too sandy
315: Shoegame-----	Fair: large stones	Probable	Probable	Poor: area reclaim small stones too sandy
Riverwash-----	Fair: large stones	Probable	Probable	Poor: area reclaim small stones too sandy
316: Millett-----	Fair: large stones slope	Improbable: excess fines	Improbable: excess fines	Poor: area reclaim large stones slope
Strych-----	Poor: slope	Improbable: excess fines	Improbable: excess fines	Poor: area reclaim slope small stones
Doakum-----	Good	Improbable: excess fines	Improbable: excess fines	Fair: slope too clayey
317: Toadlena-----	Poor: low strength depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: excess salt depth to rock
Eagleeye-----	Poor: low strength shrink-swell depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: excess salt too clayey depth to rock
318: Camino-----	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium too clayey
319: Skyhawk-----	Poor: low strength slope depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: slope
Lavellga-----	Fair: large stones	Improbable: excess fines	Improbable: excess fines	Poor: area reclaim excess lime small stones
320: Beclabito-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium

Table 12.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
320: Kinusta-----	Poor: slope depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: slope depth to rock
Badland-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: depth to rock
400: Wetherill-----	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Fair: slope too clayey
Atlatl-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: excess lime small stones
401: Vessilla-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: slope small stones depth to rock
Rock outcrop-----	Poor: depth to rock	Improbable: depth to rock	Improbable: depth to rock	Poor: slope depth to rock
402: Chazner-----	Poor: thin layer	Improbable: excess fines	Improbable: excess fines	Poor: small stones
403: Chazner-----	Poor: thin layer	Improbable: excess fines	Improbable: excess fines	Poor: small stones
Katzine-----	Poor: slope	Improbable: excess fines	Improbable: excess fines	Poor: area reclaim slope small stones
404: Wetherill-----	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Fair: too clayey
Tsezhin-----	Fair: large stones shrink-swell	Improbable: excess fines	Improbable: excess fines	Poor: area reclaim small stones
406: Rock outcrop-----	Poor: depth to rock	Improbable: depth to rock	Improbable: depth to rock	Poor: depth to rock
Nizhoni-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: depth to rock
407: Iwela-----	Poor: slope	Improbable: excess fines	Improbable: excess fines	Poor: slope small stones

Table 12.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
407: Nomrah-----	Good	Improbable: excess fines	Improbable: excess fines	Fair: small stones too clayey
Vosburg-----	Fair: shrink-swell	Improbable: excess fines	Improbable: excess fines	Fair: too clayey
408: Nizhoni-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: depth to rock
Rock outcrop-----	Poor: depth to rock	Improbable: depth to rock	Improbable: depth to rock	Poor: slope depth to rock
409: Chinlini-----	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Poor: area reclaim
410: Wetherill-----	Poor: slope	Improbable: excess fines	Improbable: excess fines	Poor: slope
411: Sojourn-----	Poor: slope depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: slope depth to rock
Badland-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: depth to rock
412: Highdye-----	Poor: low strength depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: large stones too clayey depth to rock
Menefee-----	Poor: low strength depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: slope depth to rock
413: Hozho-----	Poor: slope depth to rock	Improbable: thin layer	Improbable: too sandy	Poor: slope too sandy depth to rock
Quezcan-----	Poor: low strength shrink-swell depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: slope small stones too clayey
Rock outcrop-----	Poor: depth to rock	Improbable: depth to rock	Improbable: depth to rock	Poor: depth to rock
414: Arabrab-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: small stones depth to rock

Table 12.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
414: Wetherill-----	Fair: low strength thin layer depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: area reclaim
415: Tsezhin-----	Poor: slope	Improbable: excess fines	Improbable: excess fines	Poor: area reclaim slope small stones
416: Arabrab-----	Poor: slope depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: slope small stones depth to rock
Rock outcrop-----	Poor: slope depth to rock	Improbable: depth to rock	Improbable: depth to rock	Poor: slope depth to rock
417: Wetherill-----	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Poor: slope
418: Menefee-----	Poor: low strength slope depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: slope depth to rock
Espiritu-----	Poor: slope	Improbable: excess fines	Improbable: excess fines	Poor: area reclaim slope small stones
Rock outcrop-----	Poor: depth to rock	Improbable: depth to rock	Improbable: depth to rock	Poor: depth to rock
500: Whit-----	Fair: low strength	Improbable: excess fines	Improbable: excess fines	Fair: too clayey
501: Escavada-----	Good	Improbable: excess fines	Improbable: excess fines	Poor: too sandy
Riverwash-----	Poor: wetness	Probable	Improbable: too sandy	Poor: small stones too sandy wetness
502: Sogzie-----	Good	Improbable: excess fines	Improbable: excess fines	Good
503: Claysprings-----	Poor: low strength shrink-swell depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: excess salt too clayey depth to rock

Table 12.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
503: Badland-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: depth to rock
504: Tohona-----	Poor: low strength shrink-swell depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium small stones too clayey
Kimnoli-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: depth to rock
Claysprings-----	Poor: low strength shrink-swell depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: excess salt too clayey depth to rock
505: Recapture-----	Good	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium excess salt
Shorthair-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium depth to rock
Aneth-----	Good	Improbable: excess fines	Improbable: excess fines	Fair: too sandy
506: Blackston-----	Good	Improbable: small stones	Improbable: thin layer	Poor: area reclaim small stones
Grazane-----	Poor: slope depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: slope small stones
507: Sheppard-----	Good	Improbable: excess fines	Improbable: excess fines	Poor: too sandy
508: Shalet-----	Poor: slope depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium excess salt depth to rock
Rock outcrop-----	Poor: depth to rock	Improbable: depth to rock	Improbable: depth to rock	Poor: depth to rock
509: Trail-----	Good	Improbable: excess fines	Improbable: excess fines	Poor: too sandy
510: Aneth-----	Good	Improbable: excess fines	Improbable: excess fines	Fair: too sandy

Table 12.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
511: Redlands-----	Good	Improbable: excess fines	Improbable: excess fines	Fair: too clayey
512: Gotho-----	Fair: shrink-swell	Improbable: excess fines	Improbable: excess fines	Severe: excess sodium
513: Sogzie-----	Fair: thin layer depth to rock	Improbable: excess fines	Improbable: excess fines	Good
Aneth-----	Good	Improbable: excess fines	Improbable: excess fines	Fair: too sandy
514: Aneth-----	Good	Improbable: excess fines	Improbable: excess fines	Fair: too sandy
515: Piute-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: too sandy depth to rock
Bluechief-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Fair: small stones thin layer depth to rock
Rock outcrop-----	Poor: depth to rock	Improbable: depth to rock	Improbable: depth to rock	Poor: depth to rock
516: Kaito-----	Poor: slope	Improbable: excess fines	Improbable: excess fines	Poor: slope
Claysprings-----	Poor: low strength shrink-swell depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: excess salt too clayey depth to rock
517: Moffat-----	Good	Improbable: excess fines	Improbable: excess fines	Fair: small stones
518: Tohatin-----	Fair: slope	Improbable: excess fines	Improbable: excess fines	Poor: slope too sandy
Sheppard-----	Fair: slope	Improbable: excess fines	Improbable: excess fines	Poor: slope too sandy
519: Shumbegay-----	Good	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium too sandy

Table 12.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
520: Rock outcrop-----	Poor: depth to rock	Improbable: depth to rock	Improbable: depth to rock	Poor: slope depth to rock
Needle-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: too sandy depth to rock
521: Sandbench-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: too sandy
Sheppard-----	Good	Improbable: excess fines	Improbable: excess fines	Poor: too sandy
522: Pennell-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: small stones depth to rock
523: Tyende-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium excess salt
Aneth-----	Good	Improbable: excess fines	Improbable: excess fines	Fair: too sandy
Shumbegay-----	Fair: slope	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium slope too sandy
524: Uzaneva-----	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Poor: excess sodium too clayey
525: Rock outcrop-----	Poor: depth to rock	Improbable: depth to rock	Improbable: depth to rock	Poor: depth to rock
526: Sandbench-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: too sandy
Rock outcrop-----	Poor: depth to rock	Improbable: depth to rock	Improbable: depth to rock	Poor: depth to rock
Piute, cool-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: too sandy depth to rock
527: Outpost-----	Good	Improbable: excess fines	Improbable: excess fines	Poor: too clayey
528: Mack-----	Good	Improbable: excess fines	Improbable: excess fines	Fair: small stones too clayey

Table 12.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
600: Kunz-----	Fair: slope	Improbable: excess fines	Improbable: excess fines	Poor: slope small stones
Yahmore-----	Good	Improbable: excess fines	Improbable: excess fines	Good
602: Bostwick-----	Good	Improbable: excess fines	Improbable: excess fines	Fair: too clayey
Canburn-----	Fair: wetness	Improbable: excess fines	Improbable: excess fines	Fair: small stones
604: Yahmore-----	Good	Improbable: excess fines	Improbable: excess fines	Fair: slope
Sandark-----	Good	Improbable: excess fines	Improbable: excess fines	Poor: too sandy
606: Narbona-----	Poor: slope	Improbable: excess fines	Improbable: excess fines	Poor: area reclaim small stones too sandy
Deza-----	Good	Improbable: excess fines	Improbable: excess fines	Poor: too sandy
608: Narbona-----	Poor: slope	Improbable: excess fines	Improbable: excess fines	Poor: area reclaim small stones too sandy
Zilditloi-----	Poor: slope	Improbable: excess fines	Improbable: excess fines	Poor: too sandy slope
610: Kunz-----	Good	Improbable: excess fines	Improbable: excess fines	Fair: slope too clayey
Xankey-----	Poor: slope	Improbable: excess fines	Improbable: excess fines	Poor: large stones slope
612: Xankey-----	Poor: slope	Improbable: excess fines	Improbable: excess fines	Poor: large stones slope
614: Kunz-----	Poor: slope	Improbable: excess fines	Improbable: excess fines	Poor: slope
Tuntsa-----	Good	Improbable: excess fines	Improbable: excess fines	Fair: slope small stones

Table 12.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
614: Yahmore-----	Good	Improbable: excess fines	Improbable: excess fines	Fair: slope
616: Ligai-----	Poor: large stones slope depth to rock	Improbable: large stones excess fines	Improbable: large stones excess fines	Poor: slope small stones
Pastorpeak-----	Poor: large stones slope	Improbable: large stones excess fines	Improbable: large stones excess fines	Poor: area reclaim large stones slope
Rock outcrop-----	Poor: depth to rock	Improbable: depth to rock	Improbable: depth to rock	Poor: depth to rock
618: Zibetod-----	Poor: slope depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: large stones slope depth to rock
Bigpaw-----	Good	Improbable: excess fines	Improbable: excess fines	Fair: slope small stones
700: Akhoni-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: depth to rock
Retaw-----	Poor: wetness	Improbable: excess fines	Improbable: excess fines	Poor: too clayey wetness
702: Bikeyah-----	Fair: wetness	Improbable: excess fines	Improbable: excess fines	Fair: slope small stones
Berland-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: depth to rock
704: Klizhin-----	Poor: slope	Improbable: excess fines	Improbable: excess fines	Poor: slope
Captom-----	Poor: slope	Improbable: excess fines	Improbable: excess fines	Poor: slope small stones
706: Todacheene-----	Good	Improbable: excess fines	Improbable: excess fines	Poor: area reclaim
Viewpoint-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: small stones depth to rock

Table 12.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
706: Owlspring-----	Fair: wetness	Improbable: excess fines	Improbable: excess fines	Fair: small stones too clayey
708: Tunitcha-----	Poor: slope	Improbable: excess fines	Improbable: excess fines	Poor: slope small stones
Bangston-----	Poor: slope	Probable	Probable	Poor: area reclaim slope
710: Akhoni-----	Poor: depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: depth to rock
Klizhin-----	Fair: slope thin layer depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: slope
712: Sonsela-----	Poor: slope	Improbable: excess fines	Improbable: excess fines	Poor: area reclaim slope small stones
Washpass-----	Poor: slope	Improbable: excess fines	Improbable: excess fines	Poor: area reclaim slope small stones
Viewpoint-----	Poor: slope depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: slope small stones depth to rock
W: Water-----	---	---	---	---

Table 13.--Water Management

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable.)

Map symbol and soil name	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions
100: Werito-----	Severe: excess gypsum	Severe: excess sodium excess gypsum	Severe: no water	Limitation: deep to water	Limitation: excess sodium excess salt excess gypsum	Limitation: percs slowly excess gypsum depth to rock
102: Blackston-----	Severe: seepage	Severe: seepage	Severe: no water	Limitation: deep to water	Limitation: droughty	Limitation: large stones too sandy
Camac-----	Severe: slope	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: excess salt slope depth to rock	Limitation: slope depth to rock
Rock outcrop-----	Severe: slope depth to rock	Severe: depth to rock	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: slope depth to rock
105: Hamburn-----	Slight	Severe: excess sodium excess salt	Severe: no water	Limitation: deep to water	Limitation: excess sodium flooding droughty	Favorable
107: Tocito-----	Moderate: seepage	Moderate: piping	Severe: no water	Limitation: deep to water	Limitation: erodes easily excess salt soil blowing	Limitation: erodes easily soil blowing
Gullied land-----	Severe: slope	Moderate: piping	Severe: no water	Limitation: deep to water	Limitation: excess salt slope	Limitation: slope
110: Brimhall-----	Severe: seepage excess gypsum	Severe: piping excess gypsum	Severe: no water	Limitation: deep to water	Limitation: fast intake soil blowing excess gypsum	Limitation: soil blowing excess gypsum
Benally-----	Moderate: seepage depth to rock	Severe: excess sodium	Severe: no water	Limitation: deep to water	Limitation: excess sodium excess salt droughty	Limitation: erodes easily excess gypsum
Genats-----	Severe: slope	Severe: excess sodium thin layer	Severe: no water	Limitation: deep to water	Limitation: fast intake slope droughty	Limitation: slope soil blowing depth to rock

Table 13.--Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions
113: Gyptur-----	Severe: seepage excess gypsum	Severe: excess sodium excess salt excess gypsum	Severe: no water	Limitation: deep to water	Limitation: erodes easily excess sodium excess gypsum	Limitation: erodes easily soil blowing excess gypsum
115: Denazar-----	Severe: seepage	Severe: seepage piping	Severe: no water	Limitation: deep to water	Limitation: fast intake soil blowing droughty	Limitation: soil blowing
Farb-----	Severe: depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: fast intake droughty	Limitation: soil blowing depth to rock
117: Badland-----	Severe: slope depth to rock	Slight	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: slope depth to rock
Rock outcrop-----	Severe: slope depth to rock	Severe: depth to rock	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: slope depth to rock
120: Nageezi-----	Severe: seepage	Severe: piping	Severe: no water	Limitation: deep to water	Limitation: fast intake slope soil blowing	Limitation: soil blowing
Denazar-----	Severe: seepage	Severe: seepage piping	Severe: no water	Limitation: deep to water	Limitation: fast intake slope droughty	Limitation: too sandy soil blowing
122: Blueflat-----	Severe: excess gypsum	Severe: excess sodium thin layer excess gypsum	Severe: no water	Limitation: deep to water	Limitation: percs slowly slope depth to rock	Limitation: erodes easily excess gypsum depth to rock
Notal-----	Moderate: slope	Severe: excess sodium	Severe: no water	Limitation: deep to water	Limitation: excess sodium percs slowly slope	Limitation: percs slowly
125: Kimbeto-----	Severe: seepage	Severe: excess sodium piping	Severe: no water	Limitation: deep to water	Limitation: fast intake soil blowing droughty	Limitation: soil blowing
130: Badland-----	Severe: slope depth to rock	Slight	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: slope depth to rock
Genats-----	Severe: slope	Severe: excess sodium thin layer	Severe: no water	Limitation: deep to water	Limitation: slope	Limitation: slope depth to rock

Table 13.--Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions
133: Razito-----	Severe: seepage	Severe: seepage piping	Severe: no water	Limitation: deep to water	Limitation: fast intake slope droughty	Limitation: too sandy soil blowing
135: Farb-----	Severe: slope depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: fast intake slope droughty	Limitation: slope soil blowing depth to rock
Rock outcrop-----	Severe: slope depth to rock	Severe: depth to rock	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: slope depth to rock
Badland-----	Severe: slope depth to rock	Slight	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: slope depth to rock
137: Persayo-----	Severe: slope depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: erodes easily slope depth to rock
Cairn-----	Severe: seepage excess gypsum	Severe: large stones excess gypsum	Severe: no water	Limitation: deep to water	Limitation: large stones slope excess gypsum	Limitation: large stones excess gypsum
Patel-----	Severe: slope excess gypsum	Severe: excess sodium excess gypsum	Severe: no water	Limitation: deep to water	Limitation: slope excess gypsum depth to rock	Limitation: slope excess gypsum depth to rock
140: Benally-----	Severe: seepage	Severe: excess sodium	Severe: no water	Limitation: deep to water	Limitation: excess sodium fast intake soil blowing	Limitation: soil blowing
142: Bebeever-----	Severe: seepage	Severe: seepage	Moderate: cutbanks cave deep to water	Limitation: deep to water	Limitation: fast intake soil blowing droughty	Limitation: too sandy soil blowing
Walrees-----	Severe: seepage	Severe: seepage	Severe: slow refill cutbanks cave	Limitation: flooding cutbanks cave	Limitation: wetness soil blowing droughty	Limitation: too sandy wetness soil blowing
145: Razito-----	Severe: seepage	Severe: seepage piping	Severe: no water	Limitation: deep to water	Limitation: fast intake slope droughty	Limitation: too sandy soil blowing

Table 13.--Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions
145: Huerfano-----	Severe: depth to rock	Severe: excess sodium	Severe: no water	Limitation: deep to water	Limitation: excess sodium depth to rock droughty	Limitation: depth to rock
147: Escavada-----	Severe: seepage	Severe: seepage piping	Severe: no water	Limitation: deep to water	Limitation: fast intake soil blowing droughty	Limitation: too sandy soil blowing
150: Chipeta-----	Severe: slope depth to rock	Severe: excess sodium excess salt	Severe: no water	Limitation: deep to water	Limitation: percs slowly slope droughty	Limitation: erodes easily slope depth to rock
Badland-----	Severe: slope depth to rock	Slight	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: slope depth to rock
Moncisco-----	Severe: seepage slope	Severe: large stones seepage	Severe: no water	Limitation: deep to water	Limitation: large stones slope droughty	Limitation: large stones slope
153: Green River-----	Severe: seepage	Severe: piping	Moderate: slow refill cutbanks cave deep to water	Limitation: deep to water	Limitation: excess salt soil blowing	Limitation: erodes easily soil blowing
Green River, saline----	Severe: seepage	Severe: excess salt piping	Severe: salty water cutbanks cave	Limitation: deep to water	Limitation: excess salt soil blowing droughty	Limitation: too sandy soil blowing
155: Mesa-----	Severe: seepage	Moderate: large stones	Severe: no water	Limitation: deep to water	Limitation: soil blowing	Limitation: large stones soil blowing
157: Werjo, saline-----	Slight	Severe: excess sodium excess salt	Severe: slow refill salty water	Limitation: deep to water	Limitation: excess salt soil blowing droughty	Limitation: erodes easily
Werjo-----	Slight	Moderate: piping wetness	Severe: slow refill	Favorable	Limitation: erodes easily excess salt	Limitation: erodes easily
160: Notal-----	Slight	Severe: excess sodium	Severe: no water	Limitation: deep to water	Limitation: excess sodium excess salt percs slowly	Limitation: erodes easily percs slowly

Table 13.--Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions
160: Escavada-----	Moderate: seepage	Severe: seepage piping	Severe: no water	Limitation: deep to water	Limitation: soil blowing droughty	Limitation: erodes easily too sandy soil blowing
Riverwash-----	Severe: seepage	Severe: seepage piping wetness	Moderate: cutbanks cave	Limitation: flooding cutbanks cave	Limitation: fast intake wetness droughty	Limitation: too sandy wetness
163: Werlog-----	Slight	Severe: excess sodium excess salt	Severe: slow refill	Limitation: excess sodium excess salt	Limitation: excess sodium excess salt wetness	Limitation: erodes easily wetness
165: Jeddito-----	Severe: seepage	Severe: excess sodium	Severe: no water	Limitation: deep to water	Limitation: fast intake soil blowing droughty	Limitation: too sandy soil blowing
Escavada-----	Moderate: seepage	Severe: seepage piping	Severe: no water	Limitation: deep to water	Limitation: soil blowing droughty	Limitation: erodes easily too sandy soil blowing
167: Hoskay-----	Severe: seepage excess gypsum	Severe: excess sodium excess gypsum	Severe: no water	Limitation: deep to water	Limitation: excess sodium slope excess gypsum	Limitation: percs slowly excess gypsum
Patel-----	Severe: slope excess gypsum	Severe: excess sodium excess gypsum	Severe: no water	Limitation: deep to water	Limitation: slope excess gypsum depth to rock	Limitation: slope excess gypsum depth to rock
Badland-----	Severe: slope depth to rock	Slight	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: slope depth to rock
170: Notal-----	Slight	Severe: excess sodium	Severe: no water	Limitation: deep to water	Limitation: excess sodium excess salt percs slowly	Limitation: percs slowly
173: Shiprock-----	Severe: seepage	Moderate: thin layer	Severe: no water	Limitation: deep to water	Limitation: soil blowing	Limitation: erodes easily soil blowing
175: Suwanee-----	Slight	Moderate: piping	Severe: no water	Limitation: deep to water	Limitation: erodes easily flooding	Limitation: erodes easily

Table 13.--Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions
177: Notal-----	Slight	Severe: excess sodium	Severe: no water	Limitation: deep to water	Limitation: excess sodium excess salt percs slowly	Limitation: erodes easily percs slowly
180: Kimbeto-----	Severe: seepage	Severe: excess sodium piping	Severe: no water	Limitation: deep to water	Limitation: fast intake soil blowing droughty	Limitation: soil blowing
Huerfano-----	Severe: depth to rock	Severe: excess sodium	Severe: no water	Limitation: deep to water	Limitation: excess sodium depth to rock droughty	Limitation: soil blowing depth to rock
183: Gyptur-----	Severe: seepage slope excess gypsum	Severe: excess sodium excess salt excess gypsum	Severe: no water	Limitation: deep to water	Limitation: slope excess gypsum droughty	Limitation: erodes easily slope excess gypsum
190: Jeddito-----	Slight	Slight	Severe: no water	Limitation: deep to water	Limitation: fast intake soil blowing droughty	Limitation: too sandy soil blowing
195: Tewa-----	Severe: slope	Moderate: piping	Severe: no water	Limitation: deep to water	Limitation: excess salt slope soil blowing	Limitation: erodes easily slope soil blowing
200: Tocito-----	Moderate: seepage	Moderate: piping	Severe: no water	Limitation: deep to water	Limitation: erodes easily excess salt	Limitation: erodes easily
205: Shiprock-----	Severe: seepage	Slight	Severe: no water	Limitation: deep to water	Limitation: fast intake slope soil blowing	Limitation: soil blowing
Farb-----	Severe: depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: fast intake slope droughty	Limitation: soil blowing depth to rock
210: Mack-----	Severe: seepage	Slight	Severe: no water	Limitation: deep to water	Limitation: soil blowing	Limitation: soil blowing
Mesa-----	Severe: seepage	Moderate: large stones	Severe: no water	Limitation: deep to water	Limitation: soil blowing	Limitation: large stones soil blowing

Table 13.--Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions
215: Persayo-----	Severe: depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: slope soil blowing depth to rock	Limitation: erodes easily depth to rock
Fordbutte-----	Moderate: seepage depth to rock	Severe: excess sodium	Severe: no water	Limitation: deep to water	Limitation: erodes easily soil blowing depth to rock	Limitation: erodes easily soil blowing depth to rock
220: Chinde-----	Severe: excess gypsum	Severe: excess sodium excess salt excess gypsum	Severe: no water	Limitation: deep to water	Limitation: excess sodium excess gypsum droughty	Limitation: erodes easily excess gypsum
230: Ravola-----	Moderate: seepage	Moderate: piping	Severe: no water	Limitation: deep to water	Limitation: erodes easily flooding soil blowing	Limitation: erodes easily soil blowing
235: Wingrock-----	Severe: seepage slope	Severe: seepage	Severe: no water	Limitation: deep to water	Limitation: fast intake slope droughty	Limitation: slope too sandy soil blowing
Rock outcrop-----	Severe: slope depth to rock	Severe: depth to rock	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: slope depth to rock
240: Nageezi-----	Severe: seepage	Severe: piping	Severe: no water	Limitation: deep to water	Limitation: fast intake slope soil blowing	Limitation: soil blowing
245: Tsebitai-----	Moderate: seepage	Severe: piping	Severe: no water	Limitation: deep to water	Limitation: erodes easily excess salt soil blowing	Limitation: erodes easily soil blowing
250: Littlehat-----	Severe: slope	Severe: excess sodium excess salt	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock droughty	Limitation: erodes easily slope depth to rock
Persayo-----	Severe: depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: slope soil blowing depth to rock	Limitation: erodes easily depth to rock
Nataani-----	Severe: seepage excess gypsum	Severe: piping excess gypsum	Severe: no water	Limitation: deep to water	Limitation: slope soil blowing depth to rock	Limitation: erodes easily excess gypsum depth to rock

Table 13.--Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions
255: Benally-----	Moderate: slope excess gypsum	Severe: excess sodium excess salt	Severe: no water	Limitation: deep to water	Limitation: slope soil blowing droughty	Limitation: soil blowing excess gypsum
260: Littlehat-----	Severe: slope	Severe: excess sodium excess salt	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock droughty	Limitation: erodes easily slope depth to rock
Persayo-----	Severe: slope depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: erodes easily slope depth to rock
Badland-----	Severe: slope depth to rock	Slight	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: slope depth to rock
265: Camac-----	Severe: slope	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: excess salt slope depth to rock	Limitation: slope depth to rock
Kimbeto-----	Moderate: seepage	Severe: excess sodium	Severe: no water	Limitation: deep to water	Limitation: soil blowing droughty	Limitation: erodes easily soil blowing
Badland-----	Severe: slope depth to rock	Slight	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: slope depth to rock
270: Fruitland-----	Severe: seepage	Slight	Severe: no water	Limitation: deep to water	Favorable	Favorable
275: Razito-----	Severe: seepage	Severe: seepage piping	Severe: no water	Limitation: deep to water	Limitation: fast intake slope droughty	Limitation: too sandy soil blowing
285: Water-----	---	---	---	---	---	---
Riverwash-----	Severe: seepage	Severe: wetness	Severe: cutbanks cave	Limitation: flooding cutbanks cave	Limitation: fast intake wetness droughty	Limitation: large stones too sandy wetness
290: Mesa-----	Severe: seepage	Severe: seepage	Severe: slow refill	Limitation: deep to water	Limitation: percs slowly	Limitation: too sandy

Table 13.--Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions
295: Mesa-----	Severe: seepage	Severe: seepage	Moderate: slow refill cutbanks cave deep to water	Limitation: deep to water	Favorable	Limitation: too sandy
300: Farview-----	Severe: depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: slope soil blowing droughty	Limitation: soil blowing depth to rock
Rock outcrop-----	Severe: slope depth to rock	Severe: depth to rock	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: slope depth to rock
301: Farview-----	Severe: depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: slope soil blowing droughty	Limitation: soil blowing depth to rock
Sanostee-----	Moderate: seepage slope depth to rock	Severe: piping	Severe: no water	Limitation: deep to water	Limitation: fast intake slope droughty	Limitation: soil blowing depth to rock
Rock outcrop-----	Severe: slope depth to rock	Severe: depth to rock	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: slope depth to rock
302: Doakum-----	Moderate: seepage slope depth to rock	Moderate: piping thin layer	Severe: no water	Limitation: deep to water	Limitation: excess salt slope soil blowing	Limitation: erodes easily soil blowing
303: Snapill-----	Moderate: seepage slope depth to rock	Severe: excess sodium	Severe: no water	Limitation: deep to water	Limitation: erodes easily slope soil blowing	Limitation: erodes easily soil blowing
304: Farview-----	Severe: depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: slope soil blowing droughty	Limitation: soil blowing depth to rock
Beclabito-----	Moderate: slope depth to rock	Severe: excess sodium	Severe: no water	Limitation: deep to water	Limitation: slope soil blowing droughty	Limitation: soil blowing
Rock outcrop-----	Severe: slope depth to rock	Severe: depth to rock	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: slope depth to rock

Table 13.--Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions
305:						
Strych-----	Severe: seepage slope	Moderate: large stones	Severe: no water	Limitation: deep to water	Limitation: large stones slope droughty	Limitation: large stones slope
Eagleye-----	Severe: slope depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: percs slowly slope depth to rock	Limitation: erodes easily slope depth to rock
Rock outcrop-----	Severe: slope depth to rock	Severe: depth to rock	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: slope depth to rock
306:						
Arches-----	Severe: slope depth to rock	Severe: piping	Severe: no water	Limitation: deep to water	Limitation: fast intake slope droughty	Limitation: slope too sandy depth to rock
Kitsili-----	Severe: seepage	Slight	Severe: no water	Limitation: deep to water	Limitation: slope soil blowing	Limitation: erodes easily soil blowing
Mido-----	Severe: seepage	Severe: piping	Severe: no water	Limitation: deep to water	Limitation: fast intake slope droughty	Limitation: too sandy soil blowing
307:						
Bodot-----	Severe: slope	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: percs slowly slope depth to rock	Limitation: percs slowly slope depth to rock
Beclabito-----	Severe: slope	Severe: excess sodium	Severe: no water	Limitation: deep to water	Limitation: excess sodium slope	Limitation: slope
Rock outcrop-----	Severe: slope depth to rock	Severe: depth to rock	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: slope depth to rock
308:						
Mcelmo-----	Severe: excess sodium seepage slope	Severe: excess sodium excess gypsum	Severe: no water	Limitation: deep to water	Limitation: percs slowly slope excess gypsum	Limitation: excess sodium percs slowly slope
Farview-----	Severe: depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: slope soil blowing	Limitation: soil blowing depth to rock

Table 13.--Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions
309: Rock outcrop-----	Severe: slope depth to rock	Severe: depth to rock	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: slope depth to rock
Rizno-----	Severe: slope depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: slope soil blowing depth to rock	Limitation: slope soil blowing depth to rock
310: Millett-----	Severe: seepage	Moderate: large stones	Severe: no water	Limitation: deep to water	Limitation: slope droughty	Limitation: large stones
Blanding-----	Moderate: seepage slope	Moderate: piping	Severe: no water	Limitation: deep to water	Limitation: erodes easily slope soil blowing	Limitation: erodes easily soil blowing
Strych-----	Severe: seepage slope	Severe: large stones	Severe: no water	Limitation: deep to water	Limitation: large stones slope droughty	Limitation: large stones slope
311: Kinusta-----	Severe: slope depth to rock	Severe: piping	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: erodes easily slope depth to rock
Eslendo-----	Severe: slope depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: slope depth to rock
Rock outcrop-----	Severe: slope depth to rock	Severe: depth to rock	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: slope depth to rock
312: Blanding-----	Moderate: seepage slope	Moderate: piping	Severe: no water	Limitation: deep to water	Limitation: erodes easily slope soil blowing	Limitation: erodes easily soil blowing
313: Marjane-----	Severe: seepage	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: slope soil blowing depth to rock	Limitation: erodes easily soil blowing depth to rock
Kitsili-----	Severe: seepage	Slight	Severe: no water	Limitation: deep to water	Limitation: fast intake slope soil blowing	Limitation: erodes easily soil blowing

Table 13.--Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions
314: Mido-----	Severe: seepage slope	Severe: piping	Severe: no water	Limitation: deep to water	Limitation: fast intake slope droughty	Limitation: slope too sandy soil blowing
315: Shoegame-----	Severe: seepage	Severe: large stones seepage	Severe: no water	Limitation: deep to water	Limitation: large stones slope droughty	Limitation: large stones too sandy
Riverwash-----	Severe: seepage	Severe: large stones seepage	Severe: no water	Limitation: deep to water	Limitation: large stones slope droughty	Limitation: large stones too sandy
316: Millett-----	Severe: seepage slope	Severe: large stones	Severe: no water	Limitation: deep to water	Limitation: large stones slope droughty	Limitation: large stones slope
Strych-----	Severe: seepage slope	Moderate: large stones	Severe: no water	Limitation: deep to water	Limitation: large stones slope droughty	Limitation: large stones slope
Doakum-----	Severe: seepage slope	Moderate: piping	Severe: no water	Limitation: deep to water	Limitation: slope soil blowing	Limitation: slope soil blowing
317: Toadlena-----	Severe: slope excess gypsum depth to rock	Severe: thin layer excess gypsum	Severe: no water	Limitation: deep to water	Limitation: slope excess gypsum depth to rock	Limitation: slope excess gypsum depth to rock
Eagleye-----	Severe: slope depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: percs slowly slope depth to rock	Limitation: erodes easily slope depth to rock
318: Camino-----	Moderate: slope	Severe: excess sodium	Severe: no water	Limitation: deep to water	Limitation: erodes easily percs slowly slope	Limitation: erodes easily percs slowly
319: Skyhawk-----	Severe: slope	Moderate: thin layer	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: erodes easily slope depth to rock
Lavellga-----	Severe: seepage slope	Severe: large stones	Severe: no water	Limitation: deep to water	Limitation: large stones slope droughty	Limitation: large stones slope

Table 13.--Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions
320: Beclabito-----	Severe: seepage slope	Severe: excess sodium piping	Severe: no water	Limitation: deep to water	Limitation: slope soil blowing depth to rock	Limitation: erodes easily slope depth to rock
Kinusta-----	Severe: slope depth to rock	Severe: piping	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: erodes easily slope depth to rock
Badland-----	Severe: slope depth to rock	Slight	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: slope depth to rock
400: Wetherill-----	Severe: slope	Moderate: piping	Severe: no water	Limitation: deep to water	Limitation: erodes easily slope soil blowing	Limitation: erodes easily slope soil blowing
Atlatl-----	Severe: slope	Severe: piping	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: slope depth to rock
401: Vessilla-----	Severe: slope depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: slope depth to rock
Rock outcrop-----	Severe: slope depth to rock	Severe: depth to rock	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: slope depth to rock
402: Chazner-----	Severe: seepage slope	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: large stones slope droughty	Limitation: cemented pan large stones slope
403: Chazner-----	Severe: seepage	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: large stones slope droughty	Limitation: cemented pan large stones
Katzine-----	Severe: seepage slope	Severe: large stones	Severe: no water	Limitation: deep to water	Limitation: large stones slope droughty	Limitation: large stones slope
404: Wetherill-----	Moderate: seepage slope	Moderate: piping	Severe: no water	Limitation: deep to water	Limitation: erodes easily slope soil blowing	Limitation: erodes easily soil blowing

Table 13.--Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions
404: Tsezhin-----	Severe: slope	Moderate: large stones	Severe: no water	Limitation: deep to water	Limitation: large stones slope droughty	Limitation: large stones slope
406: Rock outcrop-----	Severe: slope depth to rock	Severe: depth to rock	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: slope depth to rock
Nizhoni-----	Severe: slope depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: slope soil blowing depth to rock	Limitation: erodes easily slope depth to rock
407: Iwela-----	Severe: seepage slope	Moderate: large stones thin layer	Severe: no water	Limitation: deep to water	Limitation: large stones slope droughty	Limitation: large stones slope
Nomrah-----	Severe: seepage	Slight	Severe: no water	Limitation: deep to water	Limitation: slope soil blowing	Limitation: soil blowing
Vosburg-----	Moderate: seepage slope	Moderate: piping	Severe: no water	Limitation: deep to water	Limitation: erodes easily slope	Limitation: erodes easily
408: Nizhoni-----	Severe: slope depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: slope soil blowing depth to rock	Limitation: erodes easily slope depth to rock
Rock outcrop-----	Severe: slope depth to rock	Severe: depth to rock	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: slope depth to rock
409: Chinlini-----	Severe: seepage	Moderate: piping thin layer	Severe: no water	Limitation: deep to water	Limitation: erodes easily slope	Limitation: erodes easily
410: Wetherill-----	Severe: seepage slope	Moderate: piping	Severe: no water	Limitation: deep to water	Limitation: erodes easily slope soil blowing	Limitation: erodes easily slope soil blowing
411: Sojourn-----	Severe: slope depth to rock	Severe: piping	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: erodes easily slope depth to rock
Badland-----	Severe: slope depth to rock	Slight	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: slope depth to rock

Table 13.--Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions
412: Highdye-----	Severe: slope depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: percs slowly slope depth to rock	Limitation: large stones slope depth to rock
Menefee-----	Severe: slope depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: erodes easily slope depth to rock
413: Hozho-----	Severe: slope depth to rock	Severe: seepage piping	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock droughty	Limitation: slope too sandy depth to rock
Quezcan-----	Severe: slope	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: percs slowly slope depth to rock	Limitation: percs slowly slope depth to rock
Rock outcrop-----	Severe: slope depth to rock	Severe: depth to rock	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: slope depth to rock
414: Arabrab-----	Severe: slope depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: large stones slope droughty	Limitation: large stones slope depth to rock
Wetherill-----	Severe: slope	Moderate: piping thin layer	Severe: no water	Limitation: deep to water	Limitation: erodes easily slope soil blowing	Limitation: erodes easily slope soil blowing
415: Tsezhin-----	Severe: slope	Moderate: large stones	Severe: no water	Limitation: deep to water	Limitation: large stones slope droughty	Limitation: large stones slope
416: Arabrab-----	Severe: slope depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: large stones slope droughty	Limitation: large stones slope depth to rock
Rock outcrop-----	Severe: slope depth to rock	Severe: depth to rock	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: slope depth to rock
417: Wetherill-----	Severe: slope	Moderate: piping	Severe: no water	Limitation: deep to water	Limitation: erodes easily slope soil blowing	Limitation: erodes easily slope soil blowing

Table 13.--Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions
418: Menefee-----	Severe: slope depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: erodes easily slope depth to rock
Espiritu-----	Severe: slope	Severe: large stones	Severe: no water	Limitation: deep to water	Limitation: large stones slope droughty	Limitation: large stones slope
Rock outcrop-----	Severe: slope depth to rock	Severe: depth to rock	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: slope depth to rock
500: Whit-----	Moderate: seepage	Severe: piping	Severe: no water	Limitation: deep to water	Limitation: erodes easily soil blowing	Limitation: erodes easily soil blowing
501: Escavada-----	Moderate: seepage	Severe: seepage piping	Severe: no water	Limitation: deep to water	Limitation: fast intake soil blowing droughty	Limitation: too sandy soil blowing
Riverwash-----	Severe: seepage	Severe: seepage piping wetness	Moderate: cutbanks cave	Limitation: flooding cutbanks cave	Limitation: fast intake wetness droughty	Limitation: too sandy wetness
502: Sogzie-----	Severe: seepage	Severe: piping	Severe: no water	Limitation: deep to water	Limitation: fast intake slope soil blowing	Limitation: erodes easily soil blowing
503: Claysprings-----	Severe: slope depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: percs slowly slope depth to rock	Limitation: percs slowly slope depth to rock
Badland-----	Severe: slope depth to rock	Slight	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: slope depth to rock
504: Tohona-----	Severe: excess gypsum	Severe: excess sodium excess gypsum	Severe: no water	Limitation: deep to water	Limitation: percs slowly slope excess gypsum	Limitation: percs slowly excess gypsum depth to rock
Kimnoli-----	Severe: depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: fast intake slope soil blowing	Limitation: soil blowing depth to rock

Table 13.--Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions
504: Claysprings-----	Severe: slope depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: percs slowly slope depth to rock	Limitation: percs slowly slope depth to rock
505: Recapture-----	Severe: seepage excess gypsum	Severe: excess sodium excess gypsum	Severe: no water	Limitation: deep to water	Limitation: slope soil blowing excess gypsum	Limitation: soil blowing excess gypsum
Shorthair-----	Severe: depth to rock	Severe: excess sodium piping	Severe: no water	Limitation: deep to water	Limitation: fast intake slope droughty	Limitation: soil blowing depth to rock
Aneth-----	Severe: seepage	Severe: piping	Severe: no water	Limitation: deep to water	Limitation: fast intake slope droughty	Limitation: soil blowing
506: Blackston-----	Severe: seepage	Severe: seepage	Severe: no water	Limitation: deep to water	Limitation: slope soil blowing droughty	Limitation: large stones too sandy soil blowing
Grazane-----	Severe: slope	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: excess salt slope depth to rock	Limitation: slope depth to rock
507: Sheppard-----	Severe: seepage	Severe: seepage piping	Severe: no water	Limitation: deep to water	Limitation: fast intake slope droughty	Limitation: too sandy soil blowing
508: Shalet-----	Severe: slope depth to rock	Severe: excess sodium	Severe: no water	Limitation: deep to water	Limitation: excess sodium slope depth to rock	Limitation: slope depth to rock
Rock outcrop-----	Severe: slope depth to rock	Severe: depth to rock	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: slope depth to rock
509: Trail-----	Severe: seepage	Severe: seepage piping	Severe: no water	Limitation: deep to water	Limitation: fast intake soil blowing droughty	Limitation: too sandy soil blowing
510: Aneth-----	Severe: seepage	Severe: piping	Severe: no water	Limitation: deep to water	Limitation: fast intake droughty	Limitation: soil blowing

Table 13.--Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions
511: Redlands-----	Moderate: seepage	Moderate: piping	Severe: no water	Limitation: deep to water	Limitation: fast intake soil blowing	Limitation: soil blowing
512: Gotho-----	Slight	Severe: excess sodium	Severe: no water	Limitation: deep to water	Limitation: excess sodium excess salt soil blowing	Limitation: soil blowing
513: Sogzie-----	Severe: seepage	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: fast intake slope soil blowing	Limitation: soil blowing
Aneth-----	Severe: seepage	Severe: piping	Severe: no water	Limitation: deep to water	Limitation: fast intake slope droughty	Limitation: soil blowing
514: Aneth-----	Severe: seepage	Severe: piping	Severe: no water	Limitation: deep to water	Limitation: fast intake slope droughty	Limitation: soil blowing
515: Piute-----	Severe: slope depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: fast intake slope droughty	Limitation: slope soil blowing depth to rock
Bluechief-----	Severe: seepage	Severe: piping	Severe: no water	Limitation: deep to water	Limitation: fast intake slope soil blowing	Limitation: erodes easily soil blowing depth to rock
Rock outcrop-----	Severe: slope depth to rock	Severe: depth to rock	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: slope depth to rock
516: Kaito-----	Severe: seepage slope	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: slope	Limitation: erodes easily slope
Claysprings-----	Severe: slope depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: percs slowly slope depth to rock	Limitation: percs slowly slope depth to rock
517: Moffat-----	Severe: seepage	Severe: piping	Severe: no water	Limitation: deep to water	Limitation: fast intake slope soil blowing	Limitation: erodes easily soil blowing

Table 13.--Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions
518: Tohatin-----	Severe: seepage slope	Severe: seepage piping	Severe: no water	Limitation: deep to water	Limitation: fast intake slope droughty	Limitation: slope too sandy soil blowing
Sheppard-----	Severe: seepage slope	Severe: seepage piping	Severe: no water	Limitation: deep to water	Limitation: fast intake slope droughty	Limitation: slope too sandy soil blowing
519: Shumbegay-----	Severe: seepage	Severe: piping	Severe: no water	Limitation: deep to water	Limitation: fast intake slope droughty	Limitation: too sandy soil blowing
520: Rock outcrop-----	Severe: slope depth to rock	Severe: depth to rock	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: slope depth to rock
Needle-----	Severe: slope depth to rock	Severe: seepage piping	Severe: no water	Limitation: deep to water	Limitation: fast intake slope droughty	Limitation: slope too sandy depth to rock
521: Sandbench-----	Severe: seepage	Severe: seepage piping	Severe: no water	Limitation: deep to water	Limitation: fast intake slope droughty	Limitation: too sandy soil blowing depth to rock
Sheppard-----	Severe: seepage	Severe: seepage piping	Severe: no water	Limitation: deep to water	Limitation: fast intake slope droughty	Limitation: too sandy soil blowing
522: Pennell-----	Severe: depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: fast intake slope droughty	Limitation: soil blowing depth to rock
523: Tyende-----	Severe: seepage	Severe: excess sodium excess salt piping	Severe: no water	Limitation: deep to water	Limitation: fast intake soil blowing depth to rock	Limitation: erodes easily soil blowing depth to rock
Aneth-----	Severe: seepage	Severe: piping	Severe: no water	Limitation: deep to water	Limitation: fast intake slope droughty	Limitation: soil blowing
Shumbegay-----	Severe: seepage slope	Severe: piping	Severe: no water	Limitation: deep to water	Limitation: fast intake slope droughty	Limitation: slope too sandy soil blowing

Table 13.--Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions
524: Uzaneva-----	Slight	Severe: excess sodium	Severe: no water	Limitation: deep to water	Limitation: excess sodium percs slowly	Limitation: percs slowly
525: Rock outcrop-----	Severe: slope depth to rock	Severe: depth to rock	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: slope depth to rock
526: Sandbench-----	Severe: seepage	Severe: seepage piping	Severe: no water	Limitation: deep to water	Limitation: fast intake slope droughty	Limitation: too sandy soil blowing depth to rock
Rock outcrop-----	Severe: slope depth to rock	Severe: depth to rock	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: slope depth to rock
Piute, cool-----	Severe: depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: fast intake slope droughty	Limitation: soil blowing depth to rock
527: Outpost-----	Severe: seepage	Moderate: hard to pack thin layer	Severe: no water	Limitation: deep to water	Limitation: excess salt flooding percs slowly	Limitation: percs slowly
528: Mack-----	Severe: seepage	Moderate: piping	Severe: no water	Limitation: deep to water	Limitation: soil blowing	Limitation: soil blowing
600: Kunz-----	Severe: seepage slope	Severe: piping	Severe: no water	Limitation: deep to water	Limitation: slope	Limitation: slope
Yahmore-----	Severe: seepage	Severe: piping	Severe: no water	Limitation: deep to water	Limitation: slope soil blowing	Favorable
602: Bostwick-----	Severe: seepage	Moderate: piping	Severe: no water	Limitation: deep to water	Limitation: slope soil blowing	Limitation: soil blowing
Canburn-----	Severe: seepage	Severe: wetness	Severe: slow refill cutbanks cave	Limitation: flooding frost action	Limitation: erodes easily flooding wetness	Limitation: erodes easily wetness

Table 13.--Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions
604: Yahmore-----	Severe: seepage slope	Severe: piping	Severe: no water	Limitation: deep to water	Limitation: slope soil blowing	Limitation: slope
Sandark-----	Severe: seepage slope	Severe: seepage piping	Severe: no water	Limitation: deep to water	Limitation: fast intake slope droughty	Limitation: slope too sandy soil blowing
606: Narbona-----	Severe: seepage slope	Moderate: large stones	Severe: no water	Limitation: deep to water	Limitation: large stones slope droughty	Limitation: large stones slope soil blowing
Deza-----	Severe: seepage slope	Severe: seepage piping	Severe: no water	Limitation: deep to water	Limitation: fast intake slope droughty	Limitation: slope too sandy soil blowing
608: Narbona-----	Severe: seepage slope	Moderate: large stones	Severe: no water	Limitation: deep to water	Limitation: large stones slope droughty	Limitation: large stones slope soil blowing
Zilditloi-----	Severe: seepage slope	Severe: seepage piping	Severe: no water	Limitation: deep to water	Limitation: slope droughty fast intake	Limitation: slope too sandy soil blowing
610: Kunz-----	Severe: slope	Moderate: piping	Severe: no water	Limitation: deep to water	Limitation: slope soil blowing	Limitation: slope soil blowing
Xankey-----	Severe: seepage slope	Severe: large stones	Severe: no water	Limitation: deep to water	Limitation: large stones slope droughty	Limitation: large stones slope
612: Xankey-----	Severe: seepage slope	Severe: large stones	Severe: no water	Limitation: deep to water	Limitation: large stones slope droughty	Limitation: large stones slope
614: Kunz-----	Severe: slope	Slight	Severe: no water	Limitation: deep to water	Limitation: slope	Limitation: slope
Tuntsa-----	Severe: seepage slope	Severe: piping	Severe: no water	Limitation: deep to water	Limitation: slope soil blowing	Limitation: slope soil blowing
Yahmore-----	Severe: seepage slope	Severe: piping	Severe: no water	Limitation: deep to water	Limitation: slope	Limitation: erodes easily slope

Table 13.--Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions
616: Ligai-----	Severe: slope	Severe: large stones	Severe: no water	Limitation: deep to water	Limitation: large stones slope droughty	Limitation: large stones slope depth to rock
Pastorpeak-----	Severe: slope	Severe: large stones	Severe: no water	Limitation: deep to water	Limitation: large stones slope droughty	Limitation: large stones slope
Rock outcrop-----	Severe: slope depth to rock	Severe: depth to rock	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock	Limitation: slope depth to rock
618: Zibetod-----	Severe: slope depth to rock	Severe: large stones	Severe: no water	Limitation: deep to water	Limitation: large stones slope droughty	Limitation: large stones slope depth to rock
Bigpaw-----	Severe: slope	Moderate: piping	Severe: no water	Limitation: deep to water	Limitation: erodes easily slope	Limitation: erodes easily slope
700: Akhoni-----	Severe: slope depth to rock	Severe: piping	Severe: no water	Limitation: deep to water	Limitation: slope soil blowing depth to rock	Limitation: slope soil blowing depth to rock
Retaw-----	Slight	Severe: piping ponding	Severe: no water	Limitation: percs slowly ponding cutbanks cave	Limitation: percs slowly ponding	Limitation: erodes easily too sandy ponding
702: Bikeyah-----	Severe: slope	Moderate: wetness	Moderate: slow refill deep to water	Limitation: slope	Limitation: erodes easily slope wetness	Limitation: erodes easily slope wetness
Berland-----	Severe: slope depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: erodes easily slope depth to rock	Limitation: erodes easily slope depth to rock
704: Klizhin-----	Severe: seepage slope	Severe: piping	Severe: no water	Limitation: deep to water	Limitation: slope soil blowing	Limitation: slope soil blowing
Captom-----	Severe: seepage slope	Severe: seepage	Severe: no water	Limitation: deep to water	Limitation: fast intake slope droughty	Limitation: large stones slope too sandy

Table 13.--Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions
706: Todacheene-----	Severe: seepage slope	Slight	Severe: no water	Limitation: deep to water	Limitation: erodes easily slope	Limitation: erodes easily slope
Viewpoint-----	Severe: slope depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock droughty	Limitation: large stones slope depth to rock
Owlspring-----	Severe: seepage	Moderate: piping wetness	Severe: slow refill	Limitation: flooding slope	Limitation: erodes easily slope wetness	Limitation: erodes easily wetness
708: Tunitcha-----	Severe: seepage slope	Moderate: large stones piping thin layer	Severe: no water	Limitation: deep to water	Limitation: slope	Limitation: large stones slope
Bangston-----	Severe: seepage slope	Severe: seepage piping	Severe: no water	Limitation: deep to water	Limitation: fast intake slope droughty	Limitation: slope too sandy soil blowing
710: Akhoni-----	Severe: slope depth to rock	Severe: piping	Severe: no water	Limitation: deep to water	Limitation: slope soil blowing depth to rock	Limitation: slope soil blowing depth to rock
Klizhin-----	Severe: seepage slope	Severe: piping	Severe: no water	Limitation: deep to water	Limitation: slope soil blowing	Limitation: slope soil blowing
712: Sonsela-----	Severe: slope	Moderate: large stones	Severe: no water	Limitation: deep to water	Limitation: large stones slope droughty	Limitation: large stones slope
Washpass-----	Severe: seepage slope	Slight	Severe: no water	Limitation: deep to water	Limitation: slope soil blowing droughty	Limitation: slope soil blowing
Viewpoint-----	Severe: slope depth to rock	Severe: thin layer	Severe: no water	Limitation: deep to water	Limitation: slope depth to rock droughty	Limitation: large stones slope depth to rock
W: Water-----	---	---	---	---	---	---

Table 14.--Engineering Index Properties

(Absence of an entry indicates that the data were not estimated.)

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
100: Werito-----	0-3	Loam	CL	A-6	0	0	80-95	75-90	70-85	55-70	20-30	10-15
	3-7	Clay loam	CL	A-6	0	0	80-95	75-90	70-85	55-70	30-40	15-20
	7-17	Clay loam	CL	A-6	0	0	80-95	75-90	70-85	55-70	35-40	15-20
	17-22	Silty clay, silty clay loam	CH, CL	A-6, A-7	0	0	80-95	75-90	70-85	60-80	35-55	15-30
	22-34	Silty clay, silty clay loam	CH, CL	A-6, A-7	0	0	95-100	90-100	85-95	75-85	35-55	15-30
	34-44	Weathered bedrock			---	---	---	---	---	---	---	---
102: Blackston-----	0-3	Gravelly sandy loam	SC-SM	A-2, A-4	0	10-15	80-90	65-85	50-65	25-40	20-25	5-10
	3-9	Sandy loam	SC-SM	A-4	0	0	90-100	85-95	50-70	35-50	20-25	5-10
	9-15	Gravelly sandy clay loam	SC	A-6	0	0-10	70-85	60-70	35-55	30-45	30-40	10-20
	15-35	Very gravelly coarse sandy loam	GC-GM, SC-SM	A-1, A-2	0	15-25	50-70	40-60	25-40	15-25	20-25	5-10
	35-70	Very cobbly loamy coarse sand, very cobbly coarse sand	GM, SM	A-1	0-10	25-30	50-65	40-55	20-30	5-20	---	NP
Camac-----	0-3	Very cobbly fine sandy loam	GC-GM, SC-SM	A-2	0-10	25-45	50-75	45-70	30-50	15-30	15-20	5-10
	3-17	Gravelly loam, gravelly fine sandy loam, gravelly sandy clay loam	CL-ML, SC, CL, SC-SM	A-4, A-6	0-10	10-15	70-90	65-85	50-65	35-55	20-30	5-15
	17-31	Clay loam, silt loam, loam	CL	A-6	0	0	95-100	90-100	75-90	60-80	25-40	10-20
	31-41	Weathered bedrock			---	---	---	---	---	---	---	---
Rock outcrop----	0-80	Unweathered bedrock			---	---	---	---	---	---	---	---

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10						
					inches	inches	4	10	40	200		
	In				Pct	Pct					Pct	
105: Hamburn-----												
	0-3	Clay loam	CL	A-6	0	0	95-100	90-100	75-90	50-70	35-40	15-20
	3-9	Sandy clay loam, sandy loam	CL, SC-SM, CL-ML, SC	A-4, A-6	0	0	95-100	90-100	60-80	45-70	25-35	5-15
	9-24	Sandy clay loam, clay loam	CL	A-6	0	0	95-100	90-100	70-95	55-80	35-40	15-20
	24-70	Clay loam, silty clay loam	CL	A-6, A-7	0	0	90-100	90-100	70-95	55-80	35-45	20-25
107: Tocito-----												
	0-2	Very fine sandy loam	CL-ML	A-4	0	0	100	100	95-100	70-80	20-25	5-10
	2-16	Clay loam, loam	CL	A-6	0	0	100	100	85-95	75-85	25-35	10-15
	16-63	Stratified very fine sandy loam to silt loam	CL	A-6	0	0	100	100	100	80-95	25-35	10-15
Gullied land----												
	0-3	Silt loam	CL	A-6	0	0	100	100	95-100	80-90	25-35	10-15
	3-80	Stratified very fine sandy loam to silt loam	CL	A-6	0	0	100	100	90-100	75-90	25-35	10-15
110: Brimhall-----												
	0-2	Loamy fine sand	SM	A-2	0	0	95-100	90-100	80-90	20-35	---	NP
	2-21	Fine sandy loam	CL-ML, SC-SM	A-4	0	0	90-100	85-100	75-95	35-55	15-20	5-10
	21-29	Fine sandy loam	CL-ML, SC-SM	A-4	0	0	90-100	85-100	75-95	35-55	15-20	5-10
	29-49	Gypsiferous material			0	0-10	---	---	---	---	---	---
	49-59	Weathered bedrock			---	---	---	---	---	---	---	---

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
110: Benally-----	0-1	Sandy clay loam	CL	A-6	0	0	95-100	90-100	80-95	55-70	25-30	10-15
	1-11				0	0	90-100	85-100	70-85	60-80	35-40	15-20
	11-31	Clay loam, sandy clay loam	CL	A-6	0	0	90-100	85-100	70-85	60-80	35-40	15-20
	31-52	Channery sandy clay loam, channery clay loam	GC, SC	A-2, A-6	0	0	55-75	50-70	35-55	20-40	25-35	10-15
	52-62	Weathered bedrock			---	---	---	---	---	---	---	---
Genats-----	0-4	Channery loamy fine sand	SM	A-2	0-10	0-10	70-80	65-75	50-65	15-25	15-20	NP-5
	4-13	Clay, silty clay, silty clay loam	CH, CL	A-7	0	0	80-95	75-90	65-80	60-75	40-55	15-30
	13-27	Silty clay, silty clay loam	CH, CL	A-7	0	0	95-100	90-100	85-95	75-85	40-55	15-30
	27-37	Weathered bedrock			---	---	---	---	---	---	---	---
113: Gyptur-----	0-2	Very fine sandy loam	CL-ML	A-4	0	0	100	100	80-95	65-75	20-25	5-10
	2-5	Silty clay loam, clay loam	CL	A-6	0	0	100	100	80-95	75-90	30-40	15-20
	5-17	Gypsiferous material			0	0	---	---	---	---	---	---
	17-46	Loam, clay loam	CL	A-6	0	0	100	100	80-95	75-85	25-40	10-20
	46-56	Weathered bedrock			---	---	---	---	---	---	---	---
115: Denazar-----	0-14	Fine sand	SM, SP-SM	A-2, A-3	0	0	100	95-100	90-95	5-20	---	NP
	14-31	Loamy fine sand	SM	A-2	0	0	90-100	85-100	75-90	15-30	---	NP
	31-42	Fine sand	SM, SP-SM	A-2, A-3	0	0	90-100	85-100	75-90	5-20	---	NP
	42-52	Weathered bedrock			---	---	---	---	---	---	---	---

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10						
					inches	inches	4	10	40	200		
	In				Pct	Pct					Pct	
115: Farb-----	0-6	Fine sand	SP-SM	A-3	0	0	95-100	90-100	85-95	5-10	---	NP
	6-10	Channery fine sandy loam, channery sandy loam	SM	A-2	0	0	60-80	55-75	50-70	10-30	15-25	NP-5
	10-14	Unweathered bedrock			---	---	---	---	---	---	---	---
117: Badland-----	0-60	Weathered bedrock			---	---	---	---	---	---	---	---
Rock outcrop----	0-80	Unweathered bedrock			---	---	---	---	---	---	---	---
120: Nageezi-----	0-4	Loamy fine sand	SM	A-2	0	0	100	90-100	80-90	25-35	---	NP
	4-14	Fine sandy loam	SC-SM	A-2, A-4	0	0	100	90-100	80-90	30-40	15-20	5-10
	14-32	Fine sandy loam, loam	CL-ML, SC-SM	A-4	0	0	95-100	90-95	80-90	35-55	15-20	5-10
	32-48	Fine sandy loam	SC-SM	A-4	0	0	90-95	85-90	75-85	35-45	15-20	5-10
	48-64	Loamy sand, loamy coarse sand	SM	A-2	0	0	90-95	85-90	55-70	15-25	---	NP
Denazar-----	0-11	Fine sand	SM	A-2	0	0	100	95-100	75-90	10-20	---	NP
	11-34	Loamy fine sand, loamy sand	SM	A-2	0	0	90-95	85-90	70-75	15-25	---	NP
	34-62	Sandy loam, loamy sand	SM	A-2	0	0	80-95	75-90	60-75	15-30	15-20	NP-5
122: Blueflat-----	0-2	Loam	CL	A-6	0	0	90-95	85-95	75-85	60-75	30-35	10-15
	2-7	Clay loam	CL	A-6, A-7	0	0	95-100	90-100	80-90	70-80	35-45	15-20
	7-14	Gypsiferous material			0	0	---	---	---	---	---	---
	14-27	Silty clay loam, silty clay	CL	A-7	0	0	95-100	90-100	85-95	80-90	40-50	20-25
	27-37	Weathered bedrock			---	---	---	---	---	---	---	---

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10	4	10	40	200		
					inches	inches						
	In				Pct	Pct					Pct	
122: Notal-----	0-3	Clay loam	CL	A-6	0	0	95-100	90-100	80-90	70-85	25-30	15-20
	3-13	Silty clay loam, silty clay, clay	CL	A-7	0	0	95-100	90-100	80-95	75-90	30-50	20-30
	13-70	Stratified sandy clay loam to silty clay	CL	A-7	0	0	90-100	85-100	80-95	70-90	30-50	20-30
125: Kimbeto-----	0-3	Loamy fine sand	SM	A-2	0	0	100	90-100	85-100	20-35	---	NP
	3-10	Fine sandy loam, very fine sandy loam	CL-ML, SC-SM	A-4	0	0	100	90-100	85-100	40-60	20-25	5-10
	10-18	Sandy clay loam, fine sandy loam	CL, SC	A-6	0	0	100	90-100	80-95	45-65	25-35	10-15
	18-29	Fine sandy loam, loam	CL-ML, SC-SM	A-4	0	0	95-100	90-100	75-90	40-60	25-30	5-10
	29-42	Loamy fine sand, fine sandy loam, loam	CL-ML, SC-SM, SM	A-2, A-4	0	0	95-100	90-100	75-90	30-55	15-25	NP-10
	42-52	Weathered bedrock			---	---	---	---	---	---	---	---
130: Badland-----	0-60	Weathered bedrock			---	---	---	---	---	---	---	---
Genats-----	0-3	Channery silt loam	CL-ML	A-4	0-15	0-10	70-80	60-75	50-65	50-60	20-25	5-10
	3-9	Clay, silty clay, silty clay loam	CH, CL	A-7	0	0	80-95	75-90	65-80	60-75	40-55	15-30
	9-22	Silty clay, silty clay loam	CH, CL	A-7	0	0	95-100	90-100	85-95	75-85	40-55	15-30
	22-26	Weathered bedrock			---	---	---	---	---	---	---	---

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
133: Razito-----	0-10	Sand	SM, SP-SM	A-2, A-3	0	0	100	100	60-80	5-15	---	NP
	10-70	Loamy fine sand, loamy sand, fine sand	SM	A-2	0	0	95-100	90-100	75-95	15-30	---	NP
135: Farb-----	0-2	Channery loamy fine sand	SM	A-2	0	0	60-80	55-75	50-70	10-25	---	NP
	2-5	Fine sandy loam	SC-SM, SM	A-2, A-4	0	0	95-100	90-100	85-95	20-40	15-25	NP-10
	5-8	Channery fine sandy loam, channery sandy loam	SM	A-2	0	0	60-80	55-75	50-70	10-30	15-25	NP-5
	8-18	Unweathered bedrock			---	---	---	---	---	---	---	---
Rock outcrop----	0-80	Unweathered bedrock			---	---	---	---	---	---	---	---
Badland-----	0-60	Weathered bedrock			---	---	---	---	---	---	---	---
137: Persayo-----	0-2	Loam	CL	A-6	0	0	95-100	90-100	75-85	70-80	30-35	10-15
	2-17	Silty clay loam, clay loam	CL	A-6	0	0	100	90-100	80-90	75-85	35-40	15-20
	17-21	Weathered bedrock			---	---	---	---	---	---	---	---
Cairn-----	0-2	Channery fine sandy loam	GC-GM, SC-SM	A-2, A-4	0	0-10	65-80	60-75	50-65	25-45	20-25	5-10
	2-9	Loam, clay loam	CL	A-6	0	0-10	80-95	75-90	60-75	50-70	30-40	15-20
	9-19	Very channery loam	GC	A-6	0-10	25-40	50-70	45-65	40-60	35-50	25-30	10-15
	19-46	Gypsiferous material			---	---	---	---	---	---	---	---
	46-56	Weathered bedrock			---	---	---	---	---	---	---	---

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10	4	10	40	200		
					inches	inches						
	In				Pct	Pct					Pct	
137: Patel-----	0-1	Very channery loam	GC	A-2, A-6	0	0-10	40-55	35-50	30-45	25-40	25-35	10-15
	1-8	Clay, silty clay	CL	A-7	0	0	90-100	85-100	80-95	70-90	40-50	20-25
	8-24	Silty clay loam, clay loam, clay	CL	A-7	0	0	90-100	90-100	85-95	75-90	40-50	20-25
	24-37	Clay loam, silty clay loam	CL	A-6, A-7	0	0	90-100	90-100	85-95	75-90	---	---
	37-47	Weathered bedrock			---	---	---	---	---	---	---	---
140: Benally-----	0-4	Loamy sand	SM	A-2	0	0	95-100	90-100	55-75	20-35	---	NP
	4-15	Fine sandy loam	CL-ML, SC-SM	A-4	0	0	95-100	90-100	75-90	40-55	20-25	5-10
	15-56	Sandy clay loam, clay loam	CL	A-6	0	0	95-100	90-100	65-85	55-70	35-40	15-20
	56-64	Loamy sand	SM	A-2	0	0	90-100	85-100	55-75	20-35	---	NP
142: Bebeever-----	0-4	Loamy sand	SM	A-1, A-2	0	0-15	95-100	90-100	40-60	15-30	---	NP
	4-70	Stratified very gravelly coarse sand to very fine sandy loam	SM, SP-SM	A-1, A-2	0	0-15	65-85	60-85	30-50	10-30	---	NP
Walrees-----	0-4	Fine sandy loam	SC-SM	A-4	0	0	100	100	85-100	35-50	20-25	5-10
	4-30	Stratified loamy fine sand to silty clay loam	CL	A-6	0	0	100	100	80-100	55-75	25-30	10-15
	30-62	Stratified very gravelly coarse sand to sand	SP, SP-SM	A-1	0-10	0-10	65-80	60-75	25-40	0-10	---	NP
145: Razito-----	0-8	Loamy fine sand	SM	A-2	0	0	100	100	75-90	15-30	---	NP
	8-62	Loamy fine sand, loamy sand, fine sand	SM	A-2	0	0	95-100	90-100	75-95	15-30	---	NP

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10						
					inches	inches	4	10	40	200		
	In				Pct	Pct					Pct	
145: Huerfano-----	0-1	Sandy clay loam	SC	A-6	0	0	90-100	90-100	50-70	35-50	30-35	10-15
	1-11	Sandy clay loam, clay loam	CL	A-6	0	0	90-100	90-100	60-85	50-70	30-40	15-20
	11-18	Clay loam	CL	A-6	0	0	100	100	85-95	60-85	30-40	15-20
	18-28	Weathered bedrock			---	---	---	---	---	---	---	---
147: Escavada-----	0-5	Sand	SM, SP-SM	A-2, A-3	0	0	100	90-100	50-65	5-25	---	NP
	5-70	Stratified coarse sand to very fine sandy loam	SM, SP-SM	A-2, A-3	0	0	95-100	90-100	85-90	5-25	---	NP
150: Chipeta-----	0-2	Silty clay loam	CL	A-6, A-7	0	0	95-100	90-100	75-85	80-90	35-45	15-20
	2-10	Silty clay, clay	CH, CL	A-7	0	0	0	0	0	0	40-60	20-30
	10-20	Weathered bedrock			---	---	---	---	---	---	---	---
Badland-----	0-60	Weathered bedrock			---	---	---	---	---	---	---	---
Moncisco-----	0-2	Extremely channery sandy clay loam	GC, GP-GC	A-2	0	0-10	20-30	15-25	10-25	5-15	25-30	10-15
	2-11	Extremely channery sandy clay loam, extremely channery sandy loam	GC, GP-GC, GC-GM	A-2	0-10	15-25	20-25	15-20	10-15	5-15	20-30	5-15
	11-70	Fragmental material	GP	A-1	0-15	15-40	0-5	0-5	0-5	0-5	---	NP

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10						
					inches	inches	4	10	40	200		
	In				Pct	Pct					Pct	
153: Green River-----	0-6	Fine sandy loam	CL-ML, SC-SM	A-4	0	0	100	100	80-95	45-60	20-25	5-10
	6-10	Loam	CL	A-6	0	0	100	100	85-100	55-70	25-30	10-15
	10-55	Stratified fine sandy loam to silt loam	CL-ML, SC-SM	A-4	0	0	100	100	80-95	40-60	20-25	5-10
	55-68	Stratified coarse sand to fine sandy loam	SM	A-2	0	0	95-100	90-100	50-65	10-25	---	NP
Green River, saline-----	0-2	Fine sandy loam	CL-ML, SC-SM	A-4	0	0	100	100	80-95	45-60	20-25	5-10
	2-16	Fine sandy loam	CL-ML, SC-SM	A-4	0	0	100	100	80-95	45-60	20-25	5-10
	16-52	Stratified fine sand to silt loam	CL-ML, SC-SM	A-4	0	0	100	100	80-95	40-60	20-25	5-10
	52-66	Stratified coarse sand to fine sandy loam	SM	A-2	0	0	95-100	90-100	60-80	10-25	---	NP
155: Mesa-----	0-2	Fine sandy loam	SC-SM	A-4	0	0	90-100	85-100	70-85	35-50	25-30	5-10
	2-21	Sandy clay loam, gravelly sandy clay loam	CL, SC	A-6	0	0-10	75-90	65-85	45-65	35-55	25-35	10-15
	21-37	Very cobbly sandy loam	GC-GM, SC-SM	A-2	0-10	25-40	55-70	50-65	35-50	25-35	20-30	5-10
	37-47	Very gravelly sandy loam	GC-GM, SC-SM	A-2	0-10	10-15	45-65	40-50	30-40	15-30	20-30	5-10
	47-63	Clay loam	CL	A-6	0	0	100	90-100	75-90	65-75	35-40	15-20
157: Werjo, saline---	0-4	Loam	CL	A-6	0	0	100	100	85-95	65-85	25-30	10-15
	4-12	Fine sandy loam, sandy clay loam	CL	A-6	0	0	100	100	75-85	50-65	25-30	10-15
	12-66	Stratified fine sandy loam to silty clay loam	CL	A-6	0	0	100	100	85-95	65-85	25-30	10-15

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10	4	10	40	200		
					inches	inches						
	In				Pct	Pct					Pct	
157: Werjo-----	0-6	Loam	CL	A-6	0	0	100	100	85-95	65-85	25-30	10-15
	6-12	Fine sandy loam, sandy clay loam	CL	A-6	0	0	100	100	75-85	50-65	25-30	10-15
	12-70	Stratified fine sandy loam to silty clay loam	CL	A-6	0	0	100	100	85-95	65-85	30-35	10-15
160: Notal-----	0-3	Silty clay loam	CL	A-7	0	0	100	100	95-100	80-95	30-35	15-20
	3-11	Silty clay loam, silty clay, clay	CL	A-7	0	0	95-100	90-100	80-95	75-90	30-50	20-30
	11-70	Stratified sandy clay loam to silty clay	CL	A-7	0	0	90-100	85-100	80-95	70-90	30-50	20-30
Escavada-----	0-2	Very fine sandy loam	ML	A-4	0	0	100	100	95-100	60-75	15-25	NP-5
	2-70	Stratified fine sand to silty clay	SM	A-2	0	0	95-100	90-100	85-90	10-30	---	NP
Riverwash-----	0-6	Sand	SP-SM, SP, SW, SW-SM	A-1, A-3	---	0-5	80-100	75-100	30-60	0-10	---	NP
	6-60	Stratified coarse sand to sandy loam	SM, SP, SP-SM	A-1, A-3, A-2	---	0-5	80-100	75-100	40-70	0-20	---	NP
163: Werlog-----	0-2	Silty clay loam	CL	A-6	0	0	100	100	85-100	80-95	30-40	15-20
	2-12	Silt loam, loam	CL	A-6	0	0	100	100	75-95	70-85	25-30	10-15
	12-65	Stratified fine sandy loam to silty clay	CL	A-6	0	0	100	100	80-95	70-85	30-40	15-20

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10	4	10	40	200		
					inches	inches						
	In				Pct	Pct					Pct	
165:												
Jeddito-----	0-9	Loamy fine sand	SM	A-2	0	0	100	100	80-95	15-30	15-20	NP-5
	9-27	Loamy fine sand, loamy very fine sand	SC-SM	A-2, A-4	0	0	100	100	75-95	30-45	15-25	5-10
	27-60	Stratified fine sand to silty clay loam	SC-SM	A-2, A-4	0	0	100	100	85-100	20-40	20-25	5-10
Escavada-----	0-4	Very fine sandy loam	ML	A-4	0	0	100	100	95-100	60-75	15-25	NP-5
	4-70	Stratified fine sand to silty clay	SM	A-2	0	0	95-100	90-100	85-90	10-30	---	NP
167:												
Hoskay-----	0-2	Channery loam	CL	A-6	0	0-10	70-80	65-75	60-70	50-60	25-35	10-15
	2-6	Clay loam, clay	CH, CL	A-7	0	0	90-100	85-100	80-95	60-75	40-55	20-30
	6-14	Clay loam, clay	CH, CL	A-7	0	0	90-100	85-100	80-95	60-75	40-55	20-30
	14-27	Gypsiferous material			0	0	---	---	---	---	---	---
	27-65	Stratified channery sandy clay loam to silty clay	CH, CL	A-6, A-7	0	0-10	80-100	75-100	65-90	50-75	35-55	15-30
Patel-----	0-2	Channery silty clay loam	CL	A-6	0	0-10	65-80	60-75	55-70	50-65	35-40	15-20
	2-12	Clay, silty clay	CL	A-7	0	0	90-100	85-100	80-95	70-90	40-50	20-25
	12-16	Silty clay loam, clay loam, clay	CL	A-7	0	0	90-100	90-100	85-95	75-90	40-50	20-25
	16-33	Clay loam, silty clay loam	CL	A-6, A-7	0	0	90-100	90-100	85-95	75-90	35-45	15-20
	33-37	Weathered bedrock			---	---	---	---	---	---	---	---
Badland-----	0-60	Weathered bedrock			---	---	---	---	---	---	---	---

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
170: Notal-----	0-2	Sandy clay loam	CL	A-6	0	0	100	100	70-85	55-70	20-25	10-15
	2-24	Silty clay loam, silty clay, clay	CL	A-7	0	0	95-100	90-100	80-95	75-90	30-50	20-30
	24-66	Stratified sandy clay loam to silty clay	CL	A-7	0	0	90-100	85-100	80-95	70-90	30-50	20-30
173: Shiprock-----	0-11	Fine sandy loam	SC-SM, SM	A-2, A-4	0	0	100	100	90-100	30-45	15-25	NP-10
	11-43	Fine sandy loam, very fine sandy loam	SC-SM	A-4	0	0	100	100	90-100	35-50	20-25	5-10
	43-70	Fine sandy loam, very fine sandy loam	SM	A-2, A-4	0	0	100	100	90-100	30-45	15-20	NP-5
175: Suwanee-----	0-6	Loam	CL	A-6	0	0	100	100	80-90	60-70	25-35	10-15
	6-64	Stratified fine sandy loam to silty clay loam	CL	A-6	0	0	95-100	90-100	75-85	60-70	25-40	10-20
177: Notal-----	0-6	Silty clay loam	CL	A-7	0	0	100	100	95-100	80-95	30-35	15-20
	6-11	Silty clay loam, silty clay, clay	CL	A-7	0	0	95-100	90-100	80-95	75-90	30-50	20-30
	11-70	Stratified sandy clay loam to silty clay	CL	A-7	0	0	90-100	85-100	80-95	70-90	30-50	20-30

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10	4	10	40	200		
					inches	inches						
	In				Pct	Pct					Pct	
180: Kimbeto-----	0-9	Loamy fine sand	SM	A-2	0	0	100	90-100	85-100	20-35	---	NP
	9-17	Fine sandy loam, very fine sandy loam	CL-ML, SC-SM	A-4	0	0	100	90-100	85-100	40-60	20-25	5-10
	17-25	Sandy clay loam, fine sandy loam	CL, SC	A-6	0	0	100	90-100	80-95	45-65	25-35	10-15
	25-32	Fine sandy loam, loam	CL-ML, SC-SM	A-4	0	0	95-100	90-100	75-90	40-60	25-30	5-10
	32-44	Loamy fine sand, fine sandy loam, loam	SC-SM, CL-ML, SM	A-2, A-4	0	0	95-100	90-100	75-90	30-55	15-25	NP-10
	44-48	Weathered bedrock			---	---	---	---	---	---	---	---
Huerfano-----	0-2	Fine sandy loam	SC-SM	A-2, A-4	0	0	90-100	90-100	70-90	25-45	20-30	5-10
	2-9	Sandy clay loam, clay loam	CL	A-6	0	0	90-100	90-100	60-85	50-70	30-40	15-20
	9-18	Clay loam	CL	A-6	0	0	100	100	85-95	60-85	30-40	15-20
	18-22	Weathered bedrock			---	---	---	---	---	---	---	---
183: Gyptur-----	0-2	Loam	CL	A-6	0	0	95-100	90-100	85-95	70-80	25-30	10-15
	2-25	Gypsiferous material			0	0	---	---	---	---	---	---
	25-65	Silt loam, loam	CL	A-6	0	0	100	100	80-95	75-85	25-30	10-15
190: Jeddito-----	0-5	Loamy fine sand	SM	A-2	0	0	95-100	90-100	75-85	20-35	---	NP
	5-16	Loamy sand, loamy fine sand	SM	A-2	0	0	95-100	90-100	75-85	15-25	---	NP
	16-70	Stratified loamy sand to clay loam	SC-SM	A-2, A-4	0	0	95-100	90-100	70-80	25-45	20-25	5-10

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10	4	10	40	200		
					inches	inches						
	In				Pct	Pct					Pct	
195:												
Tewa-----	0-3	Fine sandy loam	SC-SM	A-4	0	0	95-100	90-100	75-90	35-50	20-25	5-10
	3-27	Fine sandy loam, loam	CL, SC	A-6	0	0	95-100	90-100	80-100	45-65	25-30	10-15
	27-66	Fine sandy loam, sandy clay loam	CL, SC	A-6	0	0	100	100	75-95	40-60	25-30	10-15
200:												
Tocito-----	0-6	Silt loam	CL	A-6	0	0	100	100	95-100	85-95	25-35	10-15
	6-12	Clay loam, loam	CL	A-6	0	0	100	100	85-95	75-85	25-35	10-15
	12-16	Silty clay loam, clay loam	CL	A-6	0	0	100	100	95-100	80-95	35-40	15-20
	16-28	Stratified very fine sandy loam to silt loam	CL	A-6	0	0	100	100	100	80-95	25-35	10-15
	28-70	Stratified very fine sandy loam to silty clay loam	CL	A-6	0	0	100	100	95-100	80-95	25-40	10-20
205:												
Shiprock-----	0-3	Loamy fine sand	SM	A-2	0	0	100	100	85-95	20-35	---	NP
	3-36	Fine sandy loam	SC-SM	A-2, A-4	0	0	100	100	80-100	30-50	20-25	5-10
	36-66	Fine sandy loam	SC-SM	A-2, A-4	0	0	100	100	80-100	30-50	15-20	5-10
Farb-----	0-2	Fine sand	SP-SM	A-3	0	0	95-100	90-100	85-95	5-10	---	NP
	2-10	Fine sandy loam	SC-SM, SM	A-2, A-4	0	0	95-100	90-100	85-95	20-40	15-25	NP-10
	10-14	Unweathered bedrock			---	---	---	---	---	---	---	---
210:												
Mack-----	0-2	Fine sandy loam	CL-ML, SC-SM	A-4	0	0	100	90-100	70-90	40-60	25-30	5-10
	2-8	Sandy loam	SC-SM, CL-ML	A-4	0	0	95-100	90-100	65-85	45-60	20-30	5-10
	8-24	Sandy clay loam	CL, SC	A-6	0	0	100	90-100	70-90	45-60	30-35	10-15
	24-65	Sandy loam	SC-SM	A-4	0	0	100	85-90	50-65	40-50	20-25	5-10

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
210: Mesa-----	0-3	Fine sandy loam	SC-SM	A-4	0	0	90-100	85-100	70-85	35-50	25-30	5-10
	3-32	Sandy clay loam, gravelly sandy clay loam	CL, SC	A-6	0	0-10	75-90	65-85	45-65	35-55	25-35	10-15
	32-57	Very cobbly sandy loam	GC-GM, SC-SM	A-2	0-10	25-40	55-70	50-65	35-50	25-35	20-30	5-10
	57-64	Very gravelly sandy loam	GC-GM, SC-SM	A-2	0-10	10-15	45-65	40-50	30-40	15-30	20-30	5-10
215: Persayo-----	0-2	Very fine sandy loam	CL-ML	A-4	0	0	95-100	90-100	75-85	60-75	25-30	5-10
	2-18	Loam, silt loam	CL	A-6	0	0	100	90-100	80-90	75-85	25-35	10-15
	18-22	Weathered bedrock			---	---	---	---	---	---	---	---
Fordbutte-----	0-4	Very fine sandy loam	CL-ML	A-4	0	0	100	90-100	90-100	60-75	20-25	5-10
	4-26	Loam, silt loam, silty clay loam	CL	A-6	0	0	100	90-100	90-100	75-85	25-35	10-15
	26-34	Loam, silt loam, silty clay loam	CL	A-6	0	0	100	90-100	90-100	75-85	25-35	10-15
	34-44	Weathered bedrock			---	---	---	---	---	---	---	---
220: Chinde-----	0-2	Loam	CL	A-6	0	0	95-100	90-100	80-95	60-75	20-30	10-15
	2-9	Gypsiferous clay loam, loam	CL	A-6	0	0	100	95-100	90-100	75-85	25-35	10-20
	9-33	Clay, clay loam	CL	A-7	0	0	95-100	90-100	90-100	55-70	40-50	25-35
	33-64	Clay, silty clay loam	CL	A-7	0	0	90-100	85-100	85-100	80-95	40-50	25-35

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10	4	10	40	200		
					inches	inches						
	In				Pct	Pct					Pct	
230: Ravola-----	0-10	Very fine sandy loam	CL-ML	A-4	0	0	100	100	100	75-90	20-25	5-10
	10-70	Stratified loam to very fine sandy loam	CL	A-6	0	0	100	100	100	80-95	25-35	10-15
235: Wingrock-----	0-5	Gravelly loamy sand	SM	A-1	0	0	65-80	55-75	25-45	10-25	---	NP
	5-12	Sandy loam, coarse sandy loam	SC-SM	A-2, A-4	0	0	80-95	75-90	40-55	25-40	15-20	5-10
	12-36	Stratified gravelly loamy coarse sand to sandy loam	SM	A-1, A-2	0	0	65-90	60-85	25-45	10-30	15-20	NP-5
	36-70	Sandy loam, fine sandy loam	SC-SM	A-2, A-4	0	0	90-100	85-100	65-85	30-50	15-20	5-10
Rock outcrop----	0-80	Unweathered bedrock			---	---	---	---	---	---	---	---
240: Nageezi-----	0-2	Loamy fine sand	SM	A-2	0	0	100	90-100	80-90	25-35	---	NP
	2-12	Fine sandy loam	SC-SM	A-2, A-4	0	0	100	90-100	80-90	30-40	15-20	5-10
	12-42	Fine sandy loam, loam	CL-ML, SC-SM	A-4	0	0	95-100	90-95	80-90	35-55	15-20	5-10
	42-64	Loamy sand, loamy coarse sand	SM	A-2	0	0	90-95	85-90	55-70	15-25	---	NP
245: Tsebitai-----	0-5	Very fine sandy loam	CL-ML	A-4	0	0	95-100	90-100	90-100	60-75	15-20	5-10
	5-26	Loam, very fine sandy loam	CL-ML	A-4	0	0	95-100	90-100	90-100	75-85	15-20	5-10
	26-64	Loam, very fine sandy loam	CL-ML	A-4	0	0	95-100	90-100	90-100	75-85	15-20	5-10

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10	4	10	40	200		
					inches	inches						
	In				Pct	Pct					Pct	
250: Littlehat-----	0-2	Silt loam	CL	A-6	0	0	100	100	100	80-95	25-30	10-15
	2-31	Loam, silt loam, silty clay loam	CL	A-6	0	0	90-100	85-100	85-100	80-95	25-35	10-20
	31-41	Weathered bedrock			---	---	---	---	---	---	---	---
Persayo-----	0-2	Very fine sandy loam	CL-ML	A-4	0	0	95-100	90-100	75-85	60-75	25-30	5-10
	2-6	Loam, silt loam	CL	A-6	0	0	100	90-100	80-90	75-85	25-35	10-15
	6-17	Silty clay loam, clay loam	CL	A-6	0	0	100	90-100	80-90	75-85	35-40	15-20
	17-21	Weathered bedrock			---	---	---	---	---	---	---	---
Nataani-----	0-3	Very fine sandy loam	CL-ML	A-4	0	0	100	100	85-100	65-80	15-20	5-10
	3-9	Loam, very fine sandy loam	CL-ML	A-4	0	0	100	100	85-100	65-85	20-25	5-10
	9-21	Gypsiferous material			0	0	---	---	---	---	---	---
	21-30	Silt loam, very fine sandy loam	CL-ML	A-4	0	0	100	100	85-100	65-85	15-20	5-10
	30-40	Weathered bedrock			---	---	---	---	---	---	---	---
255: Benally-----	0-3	Fine sandy loam	CL-ML, SC-SM	A-4	0	0	95-100	90-100	75-90	35-55	20-25	5-10
	3-14	Fine sandy loam, loam	CL	A-6	0	0	95-100	90-100	75-90	50-65	25-35	10-15
	14-41	Clay loam	CL	A-6	0	0	95-100	90-100	80-95	55-75	35-40	15-20
	41-65	Silty clay loam	CL	A-7	0	0	100	100	95-100	85-95	40-45	20-25

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10						
					inches	inches	4	10	40	200		
	In				Pct	Pct					Pct	
260:												
Littlehat-----	0-2	Silt loam	CL	A-6	0	0	100	100	100	80-95	25-30	10-15
	2-36	Loam, silt loam, silty clay loam	CL	A-6	0	0	90-100	85-100	85-100	80-95	25-35	10-20
	36-40	Weathered bedrock			---	---	---	---	---	---	---	---
Persayo-----	0-2	Silt loam	CL-ML	A-4	0	0	95-100	90-100	80-90	70-80	25-30	5-10
	2-6	Loam, silt loam	CL	A-6	0	0	100	90-100	80-90	75-85	25-35	10-15
	6-18	Silty clay loam, clay loam	CL	A-6	0	0	100	90-100	80-90	75-85	35-40	15-20
	18-22	Weathered bedrock			---	---	---	---	---	---	---	---
Badland-----	0-60	Weathered bedrock			---	---	---	---	---	---	---	---
265:												
Camac-----	0-3	Very cobbly fine sandy loam	GC-GM, SC-SM	A-2	0-10	25-45	50-75	45-70	30-50	15-30	15-20	5-10
	3-16	Gravelly loam, gravelly fine sandy loam, gravelly sandy clay loam	CL-ML, CL, SC, SC-SM	A-4, A-6	0-10	10-15	70-90	65-85	50-65	35-55	20-30	5-15
	16-34	Clay loam, silt loam, loam	CL	A-6	0	0	95-100	90-100	75-90	60-80	25-40	10-20
	34-38	Weathered bedrock			---	---	---	---	---	---	---	---
Kimbeto-----	0-2	Fine sandy loam	SC-SM	A-4	0	0	90-100	75-90	60-85	35-50	25-30	5-10
	2-10	Loam	CL	A-6	0	0	90-100	85-100	70-80	50-65	30-35	10-15
	10-54	Fine sandy loam, loam	SC	A-6	0	0	85-90	75-90	60-85	35-50	25-35	10-15
	54-66	Cobbly sandy clay loam	SC	A-6	0	15-30	85-90	70-80	50-65	35-50	30-35	10-15

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
265: Badland-----	0-60	Weathered bedrock			---	---	---	---	---	---	---	---
270: Fruitland-----	0-7	Sandy clay loam	CL	A-6	0	0	100	90-100	75-90	50-60	25-30	10-15
	7-42	Fine sandy loam, sandy loam	SC-SM	A-4	0	0	100	90-100	65-80	35-50	15-20	5-10
	42-65	Sandy clay loam	CL	A-6	0	0	100	90-100	75-85	55-65	25-30	10-15
275: Razito-----	0-6	Loamy sand	SM	A-2	0	0	95-100	90-100	60-75	15-30	---	NP
	6-70	Loamy fine sand, loamy sand, fine sand	SM	A-2	0	0	95-100	90-100	75-95	15-30	---	NP
285: Water-----	---	---	---	---	---	---	---	---	---	---	---	---
Riverwash-----	0-6	Extremely gravelly sand	GP, GW	A-1	---	0-25	10-40	10-35	5-25	0-5	---	NP
	6-60	Stratified gravelly sand to extremely gravelly coarse sand	GP, GW, SW, SP	A-1	---	0-25	25-55	25-50	10-30	0-5	---	NP

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10	4	10	40	200		
					inches	inches						
	In				Pct	Pct					Pct	
290: Mesa-----	0-12	Clay loam	CL	A-6	0	0	95-100	95-100	85-95	65-80	40-45	15-20
	12-25	Clay loam, sandy clay loam	CL	A-6	0	0-10	85-100	85-100	80-95	55-75	30-40	10-20
	25-31	Gravelly loam, gravelly sandy clay loam	SC	A-6	0	10-15	70-85	65-85	60-70	35-50	30-35	10-15
	31-37	Very gravelly sandy clay loam	GC	A-2	0-10	15-25	45-55	40-50	25-35	15-30	30-35	10-15
	37-68	Stratified very cobbly coarse sandy loam to very cobbly coarse sand	GM, GP-GM	A-1	0-10	25-30	45-60	40-55	15-30	5-20	15-25	NP-5
295: Mesa-----	0-16	Sandy clay loam	SC	A-2, A-6	0	0	95-100	95-100	70-85	30-50	30-35	10-15
	16-29	Clay loam, sandy clay loam	CL	A-6	0	0-10	85-100	85-100	80-95	55-75	30-40	10-20
	29-35	Gravelly loam, gravelly sandy clay loam	SC	A-6	0	10-15	70-85	65-85	60-70	35-50	30-35	10-15
	35-49	Very gravelly sandy clay loam	GC	A-2	0-10	15-25	45-55	40-50	25-35	15-30	30-35	10-15
	49-80	Stratified very cobbly coarse sandy loam to very cobbly coarse sand	GM, GP-GM	A-1	0-10	25-30	45-60	40-55	15-30	5-20	15-25	NP-5

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
300: Farview-----	0-2	Channery loamy sand	SM	A-2	0	0-10	70-80	65-75	50-60	15-30	---	NP
	2-9	Channery sandy loam, channery fine sandy loam, fine sandy loam	SC-SM	A-2	0	0-10	70-95	65-90	60-80	20-35	15-20	5-10
	9-13	Unweathered bedrock			---	---	---	---	---	---	---	---
Rock outcrop----	0-80	Unweathered bedrock			---	---	---	---	---	---	---	---
301: Farview-----	0-2	Channery loamy sand	SM	A-2	0	0-10	70-80	65-75	50-60	15-30	---	NP
	2-6	Channery sandy loam, channery fine sandy loam, fine sandy loam	SC-SM	A-2	0	0-10	70-95	65-90	60-80	20-35	15-20	5-10
	6-16	Unweathered bedrock			---	---	---	---	---	---	---	---
Sanostee-----	0-2	Loamy fine sand	SM	A-2	0	0	95-100	90-100	70-85	20-35	---	NP
	2-15	Sandy clay loam, fine sandy loam, sandy loam	CL	A-6	0	0	95-100	90-100	75-90	50-65	25-35	10-15
	15-24	Loam, sandy clay loam, sandy loam	CL, CL-ML, SC-SM, SC	A-4, A-6	0	0	95-100	90-100	50-70	40-60	25-35	5-15
	24-32	Loam, sandy clay loam, sandy loam	CL-ML, CL, SC, SC-SM	A-4, A-6	0	0	95-100	90-100	50-70	40-60	25-35	5-15
	32-42	Unweathered bedrock			---	---	---	---	---	---	---	---
Rock outcrop----	0-80	Unweathered bedrock			---	---	---	---	---	---	---	---

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10	4	10	40	200		
					inches	inches						
	In				Pct	Pct					Pct	
302: Doakum-----	0-2	Fine sandy loam	CL-ML, SC-SM	A-4	0	0	100	100	75-90	45-65	15-25	5-10
	2-16	Sandy clay loam, loam	CL	A-6	0	0	100	100	80-95	55-70	25-30	10-15
	16-53	Sandy clay loam, loam, fine sandy loam	CL	A-6	0	0	100	100	75-90	55-70	25-30	10-15
	53-63	Unweathered bedrock			---	---	---	---	---	---	---	---
303: Snapill-----	0-3	Very fine sandy loam	CL-ML	A-4	0	0	100	100	90-100	70-85	15-20	5-10
	3-13	Loam, sandy clay loam	CL	A-6	0	0	100	100	95-100	75-90	20-30	10-15
	13-38	Loam, sandy clay loam, very fine sandy loam	CL	A-6	0	0	100	100	95-100	75-90	20-30	10-15
	38-53	Loam, fine sandy loam, sandy loam	CL-ML, CL, SC, SC-SM	A-4, A-6	0	0	100	100	65-85	40-65	15-30	5-15
	53-63	Weathered bedrock			---	---	---	---	---	---	---	---
304: Farview-----	0-2	Channery loamy sand	SM	A-2	0	0-10	70-80	65-75	50-60	15-30	---	NP
	2-6	Channery sandy loam, channery fine sandy loam, fine sandy loam	SC-SM	A-2	0	0-10	70-95	65-90	60-80	20-35	15-20	5-10
	6-16	Unweathered bedrock			---	---	---	---	---	---	---	---

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
304: Beclabito-----	0-4	Fine sandy loam	SC-SM	A-2, A-4	0	0	80-100	75-100	70-90	30-50	15-20	5-10
	4-14	Fine sandy loam, sandy clay loam	CL, SC	A-6	0	0	80-100	75-100	70-90	45-65	25-35	10-15
	14-36	Fine sandy loam, sandy clay loam	CL, SC	A-6	0	0	80-100	75-100	70-90	45-65	25-35	10-15
	36-45	Sandy loam, sandy clay loam	CL-ML, CL, SC, SC-SM	A-4, A-6	0	0-10	90-100	85-100	65-85	40-60	20-35	5-15
	45-56	Clay loam, silty clay loam	CL	A-6	0	0-10	90-100	85-100	75-90	50-70	35-40	15-20
	56-66	Unweathered bedrock			---	---	---	---	---	---	---	---
Rock outcrop----	0-80	Unweathered bedrock			---	---	---	---	---	---	---	---
305: Strych-----	0-3	Extremely flaggy very fine sandy loam	GC-GM	A-2	25-45	30-40	40-60	30-50	25-40	20-35	20-25	5-10
	3-15	Very flaggy very fine sandy loam	GC-GM, SC-SM	A-4	10-15	25-40	55-75	50-70	45-60	35-50	20-25	5-10
	15-47	Very stony very fine sandy loam, very stony fine sandy loam	GC-GM, SC-SM	A-2, A-4	25-40	15-25	60-80	55-75	50-70	30-50	20-25	5-10
	47-64	Very stony very fine sandy loam, very stony fine sandy loam, very stony loamy fine sand	GM, SC-SM, GC-GM, SM	A-2, A-4	25-40	15-25	60-80	55-75	50-70	20-40	15-25	NP-10

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
					Pct	Pct						
	In				Pct	Pct					Pct	
305: Eagleye-----	0-2	Very channery clay loam	GC	A-6, A-7	0-25	10-25	50-70	45-65	35-60	35-50	35-45	15-20
	2-8	Silty clay loam, silty clay	CH, CL	A-7	0	0	100	100	95-100	85-95	40-55	20-30
	8-18	Silty clay loam, silty clay	CH, CL	A-7	0	0	100	100	95-100	85-95	40-55	20-30
	18-28	Weathered bedrock			---	---	---	---	---	---	---	---
Rock outcrop----	0-80	Unweathered bedrock			---	---	---	---	---	---	---	---
306: Arches-----	0-3	Loamy fine sand	SM	A-2	0	0	100	100	80-90	25-35	---	NP
	3-14	Loamy fine sand, loamy sand	SM	A-2	0	0	100	100	70-80	25-35	---	NP
	14-18	Sand, fine sand	SM	A-2	0	0	100	100	65-80	20-30	---	NP
	18-28	Unweathered bedrock			---	---	---	---	---	---	---	---
Kitsili-----	0-7	Fine sandy loam	SC-SM	A-4	0	0	100	100	90-100	40-50	15-20	5-10
	7-14	Fine sandy loam, very fine sandy loam	SC-SM	A-4	0	0	100	100	90-100	40-50	15-20	5-10
	14-64	Fine sandy loam, very fine sandy loam	SC-SM	A-4	0	0	100	100	90-100	40-50	15-20	5-10
Mido-----	0-3	Loamy fine sand	SM	A-2, A-4	0	0	100	100	85-95	25-40	---	NP
	3-62	Loamy fine sand, fine sand	SM	A-2	0	0	100	100	85-95	20-35	---	NP

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10	4	10	40	200		
					inches	inches						
	In				Pct	Pct					Pct	
307: Bodot-----	0-3	Extremely gravelly clay loam	GC	A-2	25-40	10-15	25-45	20-40	15-35	10-25	35-40	15-20
	3-8	Silty clay, silty clay loam, clay loam	CH, CL	A-7	0	0-10	95-100	90-100	80-90	70-85	40-50	25
	8-24	Silty clay loam, clay	CH, CL	A-7	0	0	95-100	90-100	80-90	70-85	40-50	25
	24-34	Weathered bedrock			---	---	---	---	---	---	---	---
Beclabito-----	0-4	Very cobbly very fine sandy loam	GC-GM, SC-SM	A-4	10-25	30-40	60-75	55-70	50-65	35-50	20-25	5-10
	4-23	Gravelly clay loam, gravelly sandy clay loam	CL, GC, SC	A-6	0-10	10-15	65-85	60-80	50-75	40-60	35-40	15-20
	23-32	Clay loam	CL	A-6, A-7	0	0	100	100	90-100	80-95	35-45	15-20
	32-56	Clay loam, clay	CH, CL	A-7	0	0	100	100	80-95	75-90	40-55	20-30
	56-66	Weathered bedrock			---	---	---	---	---	---	---	---
Rock outcrop----	0-80	Unweathered bedrock			---	---	---	---	---	---	---	---
308: Mcelmo-----	0-1	Very gravelly sandy clay loam	GC	A-2	0	0-15	35-55	30-50	20-40	15-35	30-35	10-15
	1-14	Gravelly clay, clay, silty clay	CH, CL	A-7	0	0	75-100	70-100	60-90	50-80	45-65	25-35
	14-30	Cobbly silty clay loam, clay loam, silty clay	CH, CL	A-7	0	0-25	85-100	80-100	70-90	60-80	40-55	20-30
	30-54	Gypsiferous material			0	0	---	---	---	---	---	---
	54-64	Weathered bedrock			---	---	---	---	---	---	---	---

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10						
					inches	inches	4	10	40	200		
	In				Pct	Pct					Pct	
308: Farview-----	0-3	Fine sandy loam	SC-SM	A-2	0	0	85-95	80-90	75-85	20-35	15-20	5-10
	3-7	Channery sandy loam, channery fine sandy loam, fine sandy loam	SC-SM	A-2	0	0-10	70-95	65-90	60-80	20-35	15-20	5-10
	7-11	Unweathered bedrock			---	---	---	---	---	---	---	---
309: Rock outcrop----	0-80	Unweathered bedrock			---	---	---	---	---	---	---	---
Rizno-----	0-4	Fine sandy loam	CL-ML, SC-SM	A-4	0	0	100	100	80-95	45-60	15-20	5-10
	4-6	Gravelly fine sandy loam	SC-SM	A-2, A-4	0	0	70-85	60-75	50-65	30-45	15-20	5-10
	6-16	Unweathered bedrock			---	---	---	---	---	---	---	---
310: Millett-----	0-2	Gravelly fine sandy loam	SC-SM	A-2	0	0	65-80	60-75	50-65	20-35	15-25	5-10
	2-6	Gravelly fine sandy loam, gravelly sandy clay loam	SC	A-6	0	10-15	80-90	75-85	60-70	35-45	25-35	10-15
	6-16	Gravelly sandy clay loam	SC	A-2, A-6	0	0-15	65-80	60-75	45-60	25-40	30-35	10-15
	16-31	Very gravelly fine sandy	GC-GM	A-2	0	10-25	40-60	35-55	25-45	10-25	15-25	5-10

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
310: Blanding-----	0-2	Very fine sandy loam	CL-ML	A-4	0	0	100	100	95-100	70-85	20-25	5-10
	2-9	Very fine sandy loam, loam	CL-ML	A-4	0	0	100	100	95-100	75-90	25-30	5-10
	9-24	Sandy clay loam	CL	A-6	0	0	100	100	90-100	75-90	25-35	10-15
	24-63	Loam, sandy clay loam	CL	A-6	0	0	100	100	90-100	75-90	25-35	10-15
Strych-----	0-1	Very cobbly fine sandy loam	GC-GM, SC-SM	A-2	0-10	25-40	50-70	45-65	40-55	20-35	20-25	5-10
	1-5	Gravelly fine sandy loam, cobbly fine sandy loam	SC-SM	A-2, A-4	0	10-25	70-90	65-85	55-75	25-40	20-25	5-10
	5-42	Very cobbly fine sandy loam, very cobbly sandy loam	GC-GM, SC-SM	A-2	0-10	30-45	50-70	45-65	40-55	15-30	20-25	5-10
	42-66	Gravelly fine sandy loam	SC-SM	A-2	0	0-15	65-80	60-75	50-65	20-35	20-25	5-10
311: Kinusta-----	0-3	Channery very fine sandy loam	CL-ML, SC-SM	A-4	0	10-15	75-90	65-85	60-80	40-60	20-25	5-10
	3-17	Very fine sandy loam, silt loam	CL-ML, SC-SM	A-4	0	0	100	100	95-100	45-60	20-25	5-10
	17-27	Weathered bedrock			---	---	---	---	---	---	---	---
Eslendo-----	0-3	Very channery fine sandy loam	GC-GM	A-2	0-15	10-15	45-60	40-55	35-50	20-35	20-25	5-10
	3-18	Clay loam, loam	CL	A-6	0	0	100	100	95-100	60-70	25-35	10-15
	18-28	Weathered bedrock			---	---	---	---	---	---	---	---

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10						
					inches	inches	4	10	40	200		
	In				Pct	Pct					Pct	
312: Rock outcrop----	0-80	Unweathered bedrock			---	---	---	---	---	---	---	---
Blanding-----	0-3	Very fine sandy loam	CL-ML	A-4	0	0	100	100	95-100	70-85	20-25	5-10
	3-9	Very fine sandy loam, loam	CL-ML	A-4	0	0	100	100	95-100	75-90	25-30	5-10
	9-37	Loam	CL	A-6	0	0	100	100	90-100	75-90	25-35	10-15
	37-66	Loam, sandy clay loam	CL	A-6	0	0	100	100	90-100	75-90	25-35	10-15
313: Marjane-----	0-2	Fine sandy loam	SC-SM, SM	A-2, A-4	0	0	100	100	90-100	30-45	15-25	NP-10
	2-18	Fine sandy loam, very fine sandy loam	SC-SM	A-4	0	0	100	100	90-100	35-50	15-25	5-10
	18-28	Fine sandy loam, very fine sandy loam	SC-SM	A-4	0	0	100	100	90-100	35-50	15-25	5-10
	28-38	Unweathered bedrock			---	---	---	---	---	---	---	---
Kitsili-----	0-10	Loamy fine sand	SM	A-2	0	0	100	100	85-95	20-35	---	NP
	10-19	Fine sandy loam, very fine sandy loam	SC-SM	A-4	0	0	100	100	90-100	40-50	15-20	5-10
	19-65	Fine sandy loam, very fine sandy loam	SC-SM	A-4	0	0	100	100	90-100	40-50	15-20	5-10
314: Mido-----	0-7	Loamy fine sand	SM	A-2, A-4	0	0	100	100	85-95	25-40	---	NP
	7-62	Loamy fine sand, fine sand	SM	A-2	0	0	100	100	85-95	20-35	---	NP

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10	4	10	40	200		
					inches	inches						
	In				Pct	Pct					Pct	
315: Shoegame-----	0-4	Very cobbly sandy loam	SM	A-1, A-2	10-25	30-45	65-85	60-80	45-65	15-35	15-20	NP-5
	4-19	Stratified gravelly fine sandy loam to extremely cobbly loamy coarse sand	GM, SM	A-1	0-10	25-40	50-70	45-65	30-50	10-25	---	NP
	19-65	Stratified very cobbly sand to extremely stony coarse sand	SP-SM	A-1	40-50	30-40	70-90	65-85	30-50	5-10	---	NP
Riverwash-----	0-10	Extremely stony sand	GP, SP	A-1	45-55	25-30	40-60	35-55	15-35	0-5	---	NP
	10-80	Stratified very cobbly coarse sand to extremely stony sand	GP, SP	A-1, A-3	25-45	40-45	50-75	50-70	30-55	0-5	---	NP
316: Millett-----	0-2	Very cobbly fine sandy loam	GC-GM, SC-SM	A-2	0-15	30-45	55-75	50-70	45-60	15-35	15-25	5-10
	2-14	Cobbly sandy clay loam	CL, SC	A-6	0-10	15-30	85-95	80-90	70-80	40-55	25-35	10-15
	14-26	Very cobbly fine sandy loam, very cobbly sandy loam	SC-SM	A-2, A-4	0-15	40-50	65-85	60-80	50-65	20-40	20-30	5-10
	26-63	Very cobbly fine sandy loam, very gravelly fine sandy loam	GC-GM, SC-SM	A-2	0-10	25-40	50-70	45-65	40-55	20-35	15-25	5-10

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10						
					inches	inches	4	10	40	200		
	In				Pct	Pct					Pct	
316: Strych-----	0-2	Extremely cobbly fine sandy loam	GC-GM	A-2	15-30	40-45	40-55	30-45	25-40	10-25	20-25	5-10
	2-16	Very stony very fine sandy loam, very stony fine sandy loam	GC-GM, SC-SM	A-2, A-4	25-40	15-25	60-80	55-75	50-70	30-50	20-25	5-10
	16-53	Very stony very fine sandy loam, very stony fine sandy loam	GC-GM, SC-SM	A-2, A-4	25-40	15-25	60-80	55-75	50-70	30-50	20-25	5-10
	53-64	Very stony very fine sandy loam, very stony fine sandy loam, very stony loamy fine sand	GM, SC-SM, GC-GM, SM	A-2, A-4	25-40	15-25	60-80	55-75	50-70	20-40	15-25	NP-10
Doakum-----	0-3	Fine sandy loam	SC-SM	A-4	0	0	100	100	90-100	40-50	15-20	5-10
	3-16	Sandy clay loam	CL, SC	A-6	0	0	100	100	90-100	45-55	25-30	10-15
	16-46	Fine sandy loam, sandy clay loam	SC	A-6	0	0	100	100	90-100	40-50	25-30	10-15
	46-80	Fine sandy loam	SC-SM	A-4	0	0	100	100	90-100	40-50	15-25	5-10
317: Toadlena-----	0-1	Channery loam	CL	A-6	0	0	70-80	60-75	55-70	50-65	25-35	10-15
	1-12	Gypsiferous material			0	0	---	---	---	---	---	---
	12-18	Silty clay loam, clay loam	CL	A-6	0	0	100	100	85-95	80-90	35-40	15-20
	18-22	Weathered bedrock			---	---	---	---	---	---	---	---

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10	4	10	40	200		
					inches	inches						
	In				Pct	Pct					Pct	
317: Eagleeye-----	0-2	Very channery clay loam	GC	A-6, A-7	0-25	10-25	50-70	45-65	35-60	35-50	35-45	15-20
	2-16	Silty clay loam, silty clay	CH, CL	A-7	0	0	100	100	95-100	85-95	40-55	20-30
	16-20	Weathered bedrock			---	---	---	---	---	---	---	---
318: Camino-----	0-3	Silty clay loam	CL	A-6	0	0	95-100	90-100	80-95	75-90	35-40	15-20
	3-28	Silty clay, loam, silty clay	CL	A-6, A-7	0	0	95-100	90-100	80-95	75-90	35-45	15-25
	28-52	Silty clay loam, silty clay	CL	A-6, A-7	0	0	95-100	90-100	80-95	75-90	35-45	15-25
	52-68	Silty clay loam	CL	A-6	0	0	95-100	90-100	80-95	75-90	30-40	15-20
319: Skyhawk-----	0-2	Extremely gravelly sandy loam	GC-GM, GP-GC	A-2	10-15	25-30	25-40	20-35	15-30	5-20	20-25	5-10
	2-6	Gravelly clay loam, gravelly loam	GC, CL, SC	A-6	0	0-10	65-85	55-75	50-70	40-60	25-35	10-20
	6-23	Silty clay loam, clay loam	CL	A-6	0	0	100	100	95-100	85-95	30-40	15-20
	23-35	Silty clay loam	CL	A-6	0	0	100	100	95-100	85-95	30-40	15-20
	35-45	Weathered bedrock			---	---	---	---	---	---	---	---

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
319: Lavellga-----	0-2	Very channery fine sandy loam	GC-GM	A-2	0-10	10-25	40-60	35-55	30-50	10-30	15-25	5-10
	2-13	Very gravelly sandy clay loam, very gravelly sandy loam	GC	A-2, A-6	0-10	15-25	45-65	40-60	30-50	20-40	25-30	10-15
	13-50	Very cobbly sandy loam, extremely cobbly sandy loam, very cobbly fine sandy loam	GC-GM	A-2	10-30	30-50	40-60	35-55	25-45	10-30	20-25	5-10
	50-65	Very cobbly sandy loam, very cobbly fine sandy loam	GC-GM, SC-SM	A-2, A-4	10-15	30-40	60-80	55-75	40-60	25-45	20-25	5-10
320: Beclabito-----	0-7	Very fine sandy loam	CL-ML	A-4	0	0	95-100	90-100	85-95	60-70	15-20	5-10
	7-24	Very fine sandy loam, loam, silt loam	CL-ML	A-4	0	0	95-100	90-100	85-95	65-75	20-25	5-10
	24-31	Very fine sandy loam, loam, silt loam	CL-ML	A-4	0	0	95-100	90-100	85-95	65-75	20-25	5-10
	31-37	Very fine sandy loam, silt loam	CL-ML	A-4	0	0	100	100	85-95	60-70	15-20	5-10
	37-47	Weathered bedrock			---	---	---	---	---	---	---	---

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10						
					inches	inches	4	10	40	200		
	In				Pct	Pct					Pct	
320: Kinusta-----	0-3	Very gravelly loam	GC-GM	A-2, A-4	0-5	10-20	40-60	35-55	30-50	25-45	20-25	5-10
	3-16	Very fine sandy loam, silt loam	CL-ML, SC-SM	A-4	0	0	100	100	95-100	45-60	20-25	5-10
	16-20	Weathered bedrock			---	---	---	---	---	---	---	---
Badland-----	0-60	Weathered bedrock			---	---	---	---	---	---	---	---
400: Wetherill-----	0-3	Very fine sandy loam	CL-ML	A-4	0	0	100	100	90-100	65-80	20-25	5-10
	3-18	Loam, clay loam, sandy clay loam	CL	A-6	0	0	100	100	95-100	80-95	25-35	10-15
	18-42	Loam, clay loam, sandy clay loam	CL	A-6	0	0	100	100	95-100	80-95	25-35	10-15
	42-70	Loam, sandy clay loam, very fine sandy loam	CL	A-6	0	0	100	100	90-100	75-90	25-30	10-15
Atlatl-----	0-2	Gravelly fine sandy loam	SC-SM	A-2	0	0	65-80	60-75	55-70	20-35	20-25	5-10
	2-17	Fine sandy loam, loam	CL-ML, SC-SM	A-4	0	0-10	90-100	85-100	80-95	40-60	25-30	5-10
	17-30	Fine sandy loam, loam	CL-ML, SC-SM	A-4	0	0-10	90-100	85-100	80-95	35-55	20-25	5-10
	30-40	Unweathered bedrock			---	---	---	---	---	---	---	---

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10						
					inches	inches	4	10	40	200		
	In				Pct	Pct					Pct	
401: Vessilla-----	0-3	Channery fine sandy loam	SC-SM	A-2, A-4	0-10	0-15	80-90	75-85	60-75	25-40	15-20	5-10
	3-8	Fine sandy loam, channery fine sandy loam	SC-SM	A-2, A-4	0	0-10	80-95	75-90	65-80	30-45	15-20	5-10
	8-18	Unweathered bedrock			---	---	---	---	---	---	---	---
Rock outcrop----	0-80	Unweathered bedrock			---	---	---	---	---	---	---	---
402: Chazner-----	0-2	Very cobbly very fine sandy loam	GC-GM	A-4	0-10	30-40	60-70	50-60	45-55	35-50	20-25	5-10
	2-6	Gravelly very fine sandy loam, gravelly fine sandy loam	SC-SM	A-2, A-4	0	10-15	70-80	65-75	60-70	25-40	20-30	5-10
	6-18	Gravelly sandy clay loam, gravelly clay loam	SC	A-6	0	10-15	70-80	65-75	60-70	35-50	30-40	10-20
	18-29	Very cobbly coarse sandy loam, very cobbly sandy loam	SC-SM	A-2	0-10	40-50	65-80	60-75	55-70	20-35	15-25	5-10
	29-39	Indurated			---	---	---	---	---	---	---	---

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
403: Chazner-----	0-2	Very gravelly fine sandy loam	GC-GM	A-2, A-4	0-10	15-25	60-70	50-60	40-50	25-40	20-25	5-10
	2-6	Gravelly very fine sandy loam, gravelly fine sandy loam	SC-SM	A-2, A-4	0	10-15	70-80	65-75	60-70	25-40	20-30	5-10
	6-16	Gravelly sandy clay loam, gravelly clay loam	SC	A-6	0	10-15	70-80	65-75	60-70	35-50	30-40	10-20
	16-25	Very cobbly coarse sandy loam, very cobbly sandy loam	SC-SM	A-2	0-10	40-50	65-80	60-75	55-70	20-35	15-25	5-10
	25-29	Indurated			---	---	---	---	---	---	---	---
Katzine-----	0-7	Very cobbly very fine sandy loam	GC-GM	A-2, A-4	0-10	40-45	55-60	50-55	40-50	30-40	---	5-10
	7-47	Very cobbly fine sandy loam, very cobbly sandy loam	SC-SM	A-2	0-10	30-45	65-75	50-70	50-65	20-35	15-25	5-10
	47-63	Extremely cobbly loamy sand, extremely cobbly sand	GM	A-1	10-25	50-60	35-60	30-55	25-35	10-20	---	NP
404: Wetherill-----	0-4	Very fine sandy loam	CL-ML	A-4	0	0	100	100	90-100	65-80	20-25	5-10
	4-19	Loam, clay loam, sandy clay loam	CL	A-6	0	0	100	100	95-100	80-95	25-35	10-15
	19-65	Loam, clay loam, sandy clay loam	CL	A-6	0	0	100	100	95-100	80-95	25-35	10-15

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
404: Tsezhin-----	0-2	Very cobbly very fine sandy loam	GC-GM, SC-SM	A-4	10-15	30-45	65-80	60-75	55-70	35-50	20-30	5-10
	2-35	Very gravelly clay loam, very gravelly sandy clay loam	GC	A-6	0-10	15-25	50-65	45-60	40-55	35-50	35-40	15-20
	35-51	Very cobbly clay loam, very cobbly sandy clay loam	GC	A-6	0-10	30-45	55-75	50-70	45-65	35-50	30-40	10-20
	51-65	Very cobbly clay loam, very cobbly sandy clay loam	GC	A-6	0-10	30-45	55-75	50-70	45-65	35-50	30-40	10-20
406: Rock outcrop----	0-80	Unweathered bedrock			---	---	---	---	---	---	---	---
Nizhoni-----	0-3	Very fine sandy loam	SC-SM	A-4	0	0	100	100	85-100	35-50	20-25	5-10
	3-7	Fine sandy loam, very fine sandy loam	SC-SM	A-2, A-4	0	0	100	100	75-90	30-45	20-25	5-10
	7-17	Unweathered bedrock			---	---	---	---	---	---	---	---

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
407: Iwela-----	0-3	Very cobbly fine sandy loam	GC-GM, SC-SM	A-2, A-4	5-25	30-45	60-85	55-80	50-75	25-40	15-25	5-10
	3-26	Cobbly sandy clay loam, gravelly sandy clay loam, cobbly fine sandy loam	CL, SC	A-6	0-10	10-30	70-90	65-85	55-80	35-60	25-40	10-20
	26-44	Very stony sandy loam, very stony fine sandy loam	SC-SM	A-2, A-4	40-55	10-15	70-90	65-85	50-75	25-40	15-25	5-10
	44-64	Very stony loamy sand, very stony loamy fine sand	SM	A-2	40-55	10-15	70-90	65-85	50-70	15-30	15-20	NP-5
Nomrah-----	0-3	Fine sandy loam	SC-SM	A-4	0	0	100	100	85-95	35-50	15-20	5-10
	3-32	Sandy clay loam	CL, SC	A-6	0	0	95-100	90-100	80-95	40-55	25-40	10-20
	32-58	Sandy clay loam, fine sandy loam	SC, SC-SM	A-4, A-6	0	0	90-100	85-100	75-90	35-50	20-30	5-15
	58-62	Fine sandy loam	SC-SM	A-2, A-4	0	0	95-100	90-100	80-90	30-45	15-20	5-10
Vosburg-----	0-7	Loam	CL	A-6	0	0	100	100	85-95	50-65	25-35	10-15
	7-36	Clay loam, sandy clay loam	CL, SC	A-6	0	0	100	100	75-90	45-60	30-40	10-20
	36-65	Sandy clay loam, clay loam	CL, SC	A-6	0	0	100	100	75-90	45-60	30-40	10-20

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10						
					inches	inches	4	10	40	200		
	In				Pct	Pct					Pct	
412: Highdye-----	0-4	Flaggy fine sandy loam	SC-SM	A-4	0-5	15-30	85-95	80-90	75-85	35-50	20-25	5-10
	4-13	Sandy clay, clay loam, clay	CH, CL	A-7	0	0-10	95-100	90-100	85-100	60-75	40-55	15-25
	13-23	Unweathered bedrock			---	---	---	---	---	---	---	---
Menefee-----	0-2	Channery loam	CL, SC	A-6	0	0	70-80	65-75	55-65	45-55	25-35	10-15
	2-17	Loam, clay loam	CL	A-6	0	0	95-100	90-100	85-95	75-85	30-40	10-20
	17-27	Weathered bedrock			---	---	---	---	---	---	---	---
413: Hozho-----	0-3	Cobbly sandy loam	SM	A-1, A-2	10-25	15-30	85-95	80-90	45-60	15-25	15-20	NP-5
	3-6	Sandy loam, loamy sand	SM	A-2	0	0	90-95	85-90	50-65	15-25	15-20	NP-5
	6-14	Loamy fine sand, loamy sand, sand	SM, SP-SM	A-2, A-3	0	0	100	100	60-75	5-20	---	NP
	14-24	Weathered bedrock			---	---	---	---	---	---	---	---
Quezcan-----	0-3	Very cobbly clay loam	GC, SC	A-6, A-7	10-15	25-40	55-75	50-70	45-65	35-50	35-45	15-20
	3-6	Gravelly clay loam, silty clay loam, silty clay	CH, CL	A-7	0	0-15	80-95	75-90	65-80	55-70	40-55	20-30
	6-10	Clay loam, silty clay loam, silty clay	CL, CH	A-7	0	0	95-100	90-100	80-90	70-85	40-55	20-30
	10-27	Silty clay loam, silty clay	CH, CL	A-7	0	0	95-100	90-100	80-90	70-85	40-55	20-30
	27-37	Weathered bedrock			---	---	---	---	---	---	---	---

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
413: Rock outcrop----	0-80	Unweathered bedrock			---	---	---	---	---	---	---	---
414: Arabrab-----	0-3	Very flaggy very fine sandy loam	GC-GM	A-2, A-4	0-10	25-40	50-65	45-60	40-55	30-45	20-25	5-10
	3-16	Gravelly sandy clay loam, sandy clay loam, flaggy sandy clay loam	CL, SC	A-6	0-10	0-25	75-90	70-85	60-75	45-60	30-35	10-15
	16-20	Unweathered bedrock			---	---	---	---	---	---	---	---
Wetherill-----	0-3	Very fine sandy loam	CL-ML	A-4	0	0	100	100	95-100	50-65	20-25	5-10
	3-23	Sandy clay loam, clay loam	CL	A-6	0	0	100	100	95-100	55-70	25-35	10-15
	23-41	Sandy clay loam, clay loam	CL	A-6	0	0	100	100	95-100	55-70	25-35	10-15
	41-52	Cobbly sandy clay loam, cobbly clay loam	CL, SC	A-6	10-15	10-25	85-95	80-90	75-85	45-60	25-35	10-15
	52-62	Unweathered bedrock			---	---	---	---	---	---	---	---

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10	4	10	40	200		
					inches	inches						
	In				Pct	Pct					Pct	
415: Tsezhin-----	0-4	Extremely cobblely very fine sandy loam	GC-GM, SC-SM	A-2	25-30	40-50	50-70	40-60	35-55	20-35	20-30	5-10
	4-25	Very cobblely sandy clay loam, very cobblely clay loam	GC	A-6	0-10	15-25	55-65	50-60	45-55	35-45	30-40	10-20
	25-62	Very cobblely sandy clay loam, very cobblely clay loam	GC	A-6	0-10	30-40	55-65	50-60	45-55	35-45	30-40	10-20
416: Arabrab-----	0-2	Extremely cobblely very fine sandy loam	GC-GM	A-2	0-10	50-55	35-50	30-45	25-40	15-30	20-25	5-10
	2-15	Gravelly sandy clay loam, sandy clay loam, flaggy sandy clay loam	CL, SC	A-6	0-10	0-25	75-90	70-85	60-75	45-60	30-35	10-15
	15-25	Unweathered bedrock			---	---	---	---	---	---	---	---
Rock outcrop----	0-80	Unweathered bedrock			---	---	---	---	---	---	---	---

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10						
					inches	inches	4	10	40	200		
	In				Pct	Pct					Pct	
417: Wetherill-----	0-3	Very fine sandy loam	CL-ML	A-4	0	0	100	100	90-100	65-80	20-25	5-10
	3-25	Loam, clay loam, sandy clay loam	CL	A-6	0	0	100	100	95-100	80-95	25-35	10-15
	25-61	Loam, clay loam, sandy clay loam	CL	A-6	0	0	100	100	95-100	80-95	25-35	10-15
	61-66	Loam, sandy clay loam, very fine sandy loam	CL	A-6	0	0	100	100	90-100	75-90	25-30	10-15
418: Menefee-----	0-2	Very channery clay loam	GC	A-2	0-15	0-15	35-55	30-50	25-40	20-35	35-40	15-20
	2-18	Silty clay loam, clay loam	CL	A-6	0	0	95-100	90-100	85-95	70-80	35-40	15-20
	18-28	Weathered bedrock			---	---	---	---	---	---	---	---
Espiritu-----	0-6	Extremely flaggy sandy loam	GC-GM, SC-SM	A-2, A-4	25-40	50-55	60-75	55-70	45-60	25-40	15-25	5-10
	6-24	Very channery sandy loam, very cobbly sandy loam, very channery sandy clay loam	GC	A-2	10-15	10-25	45-65	40-60	30-50	15-35	25-35	10-15
	24-42	Very cobbly sandy clay loam, very cobbly clay loam	GC, SC	A-2, A-6	10-15	25-40	60-75	50-65	40-55	30-45	25-40	10-20
	42-70	Cobbly very fine sandy loam, cobbly fine sandy loam	SC-SM	A-4	10-15	15-30	85-95	80-90	70-80	40-50	15-25	5-10

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
418: Rock outcrop----	0-80	Unweathered bedrock			---	---	---	---	---	---	---	---
500: Whit-----	0-10	Very fine sandy loam	CL-ML	A-4	0	0	100	100	95-100	65-80	15-25	5-10
	10-38	Very fine sandy loam, loam, sandy clay loam	CL	A-6	0	0	100	100	95-100	75-90	25-35	10-15
	38-65	Very fine sandy loam, loam, fine sandy loam	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	65-80	20-35	5-15
501: Escavada-----	0-5	Loamy fine sand	SM	A-2	0	0	100	100	85-95	10-25	---	NP
	5-70	Stratified fine sand to silty clay	SM	A-2	0	0	95-100	90-100	85-90	10-30	---	NP
Riverwash-----	0-6	Sand	SP-SM, SP, SW, SW-SM	A-1, A-3	---	0-5	80-100	75-100	30-60	0-10	---	NP
	6-60	Stratified coarse sand to sandy loam	SM, SP, SP-SM	A-1, A-2, A-3	---	0-5	80-100	75-100	40-70	0-20	---	NP
502: Sogzie-----	0-10	Loamy fine sand	SM	A-2	0	0	100	100	90-100	20-35	---	NP
	10-50	Very fine sandy loam, fine sandy loam	CL-ML	A-4	0	0	100	100	95-100	55-70	15-25	5-10
	50-70	Very fine sandy loam, fine sandy loam	CL-ML	A-4	0	0	100	100	95-100	55-70	15-25	5-10

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10	4	10	40	200		
					inches	inches						
	In				Pct	Pct					Pct	
503: Claysprings-----	0-2	Extremely gravelly sandy clay loam	GC	A-2	25-40	10-15	25-45	20-40	15-30	10-25	30-35	10-15
	2-4	Clay	CH, CL	A-7	0	0	90-95	85-90	75-85	65-80	45-60	20-30
	4-12	Silty clay, clay	CH, CL	A-7	0	0	100	100	90-100	75-90	45-60	20-30
	12-16	Weathered bedrock			---	---	---	---	---	---	---	---
Badland-----	0-60	Weathered bedrock			---	---	---	---	---	---	---	---
504: Tohona-----	0-1	Very gravelly sandy clay loam	GC	A-2	0	0-15	40-60	35-55	30-50	20-35	30-40	10-15
	1-11	Clay	CH, CL	A-7	0	0-10	90-95	85-90	75-80	55-70	45-60	20-30
	11-33	Gypsiferous material			0	0	---	---	---	---	---	---
	33-43	Weathered bedrock			---	---	---	---	---	---	---	---
Kimnoli-----	0-4	Loamy fine sand	SM	A-2	0	0	100	100	90-100	20-35	---	NP
	4-9	Fine sandy loam, sandy clay loam	CL, SC	A-6	0	0	90-95	85-90	75-80	45-60	25-30	10-15
	9-19	Unweathered bedrock			---	---	---	---	---	---	---	---
Claysprings-----	0-2	Extremely gravelly sandy clay loam	GC	A-2	25-40	10-15	25-45	20-40	15-30	10-25	30-35	10-15
	2-5	Clay	CH, CL	A-7	0	0	90-95	85-90	75-85	65-80	45-60	20-30
	5-16	Silty clay, clay	CH, CL	A-7	0	0	100	100	90-100	75-90	45-60	20-30
	16-26	Weathered bedrock			---	---	---	---	---	---	---	---

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10	4	10	40	200		
					inches	inches						
	In				Pct	Pct					Pct	
505: Recapture-----	0-3	Loamy fine sand	SM	A-2	0	0	95-100	90-100	70-90	20-35	15-20	NP-5
	3-17	Fine sandy loam, sandy clay loam	CL-ML, SC, CL, SC-SM	A-4, A-6	0	0	95-100	90-100	75-90	40-60	25-35	5-15
	17-39	Sandy clay loam, clay loam	CL, SC	A-6	0	0	95-100	90-100	80-95	45-65	30-40	10-20
	39-53	Fine sandy loam	SC-SM	A-2, A-4	0	0	95-100	90-100	75-95	25-45	20-25	5-10
	53-65	Loamy fine sand	SM	A-2	0	0	95-100	90-100	70-90	15-30	15-20	NP-5
Shorthair-----	0-1	Gravelly loamy fine sand	SM	A-2	0	0-10	70-80	65-75	60-70	20-35	---	NP
	1-5	Fine sandy loam, sandy clay loam	SC	A-2, A-6	0	0	90-95	85-90	65-80	25-45	25-35	10-15
	5-16	Fine sandy loam, loamy fine sand	SC-SM, SM	A-2, A-4	0	0	90-100	85-100	75-90	25-40	15-25	NP-10
	16-26	Unweathered bedrock			---	---	---	---	---	---	---	---
Aneth-----	0-8	Loamy fine sand	SM	A-2	0	0	100	100	80-95	20-35	---	NP
	8-28	Loamy fine sand	SM	A-2	0	0	100	100	85-95	20-35	---	NP
	28-37	Fine sandy loam, very fine sandy loam	SC-SM	A-4	0	0	95-100	90-100	75-90	35-50	20-25	5-10
	37-65	Loamy fine sand, fine sandy loam	SC-SM, SM	A-2, A-4	0	0	95-100	90-100	75-90	20-40	15-25	NP-10
506: Blackston-----	0-9	Fine sandy loam	SC-SM	A-2, A-4	0	0	80-95	75-90	70-85	30-45	15-25	5-10
	9-25	Loam, gravelly loam	CL	A-6	0	0-15	70-90	65-85	60-80	50-60	25-35	10-15
	25-49	Extremely gravelly loamy sand	GM, GP-GM	A-1	0	15-30	20-35	15-30	10-20	5-15	---	NP
	49-66	Loamy sand	SM	A-2	0	0	80-95	75-90	55-65	20-35	---	NP

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
506: Grazane-----	0-2	Very cobbly fine sandy loam	GC-GM, SC-SM	A-4	0-10	40-50	60-80	55-75	55-70	35-50	20-25	5-10
	2-6	Gravelly fine sandy loam	SC-SM	A-4	0-10	10-15	70-85	65-80	60-70	35-50	20-25	5-10
	6-20	Sandy clay loam, clay loam	CL	A-6	0	0-10	90-100	85-100	80-95	50-65	35-40	15-20
	20-26	Clay loam, sandy clay loam	CL	A-6	0	0	100	100	90-100	55-70	35-40	15-20
	26-36	Weathered bedrock			---	---	---	---	---	---	---	---
507: Sheppard-----	0-3	Loamy fine sand	SM	A-2	0	0	100	100	80-95	20-35	---	NP
	3-70	Loamy fine sand, fine sand	SM	A-2	0	0	100	100	75-90	15-30	---	NP
508: Shalet-----	0-3	Sandy clay loam	CL, SC	A-6	0	0	100	100	85-95	40-55	30-35	10-15
	3-6	Sandy clay loam, clay loam	CL	A-6	0	0	100	100	85-95	50-65	30-40	10-20
	6-15	Sandy clay loam, clay loam	CL	A-6	0	0	100	100	85-95	50-65	30-40	10-20
	15-25	Weathered bedrock			---	---	---	---	---	---	---	---
Rock outcrop----	0-80	Unweathered bedrock			---	---	---	---	---	---	---	---
509: Trail-----	0-5	Loamy fine sand	SM	A-2	0	0	100	100	75-85	20-30	---	NP
	5-70	Stratified sand to silt loam	SM	A-2	0	0	100	100	60-75	10-30	---	NP

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
510: Aneth-----	0-2	Loamy fine sand	SM	A-2	0	0	100	100	80-95	20-35	---	NP
	2-36	Loamy fine sand	SM	A-2	0	0	100	100	85-95	20-35	---	NP
	36-65	Fine sandy loam, very fine sandy loam	SC-SM	A-4	0	0	95-100	90-100	75-90	35-50	20-25	5-10
511: Redlands-----	0-2	Loamy fine sand	SM	A-2	0	0	100	100	90-100	20-30	---	NP
	2-13	Fine sandy loam	SC-SM	A-2	0	0	100	100	90-100	25-35	15-25	5-10
	13-22	Fine sandy loam, sandy clay loam	SC	A-6	0	0	100	100	80-95	35-50	25-30	10-15
	22-65	Clay loam, sandy clay loam	CL, SC	A-6	0	0	100	100	85-95	40-60	30-35	10-15
512: Gotho-----	0-2	Fine sandy loam	SC-SM	A-4	0	0	100	100	90-100	40-50	20-25	5-10
	2-13	Clay loam, sandy clay loam	CL	A-6	0	0	100	100	95-100	50-60	30-40	10-20
	13-66	Stratified fine sandy loam to clay loam	CL, SC	A-6	0	0	100	100	90-100	40-60	25-40	10-20
513: Sogzie-----	0-4	Loamy fine sand	SM	A-2	0	0	100	100	85-95	20-30	---	NP
	4-14	Loamy fine sand	SM	A-2	0	0	100	100	85-95	20-30	---	NP
	14-36	Fine sandy loam	SC-SM	A-2, A-4	0	0	100	100	80-90	30-40	20-25	5-10
	36-42	Loamy fine sand, loamy sand	SM	A-2	0	0	100	100	75-85	15-25	15-20	NP-5
	42-52	Weathered bedrock			---	---	---	---	---	---	---	---

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10						
					inches	inches	4	10	40	200		
	In				Pct	Pct					Pct	
513: Aneth-----	0-7	Loamy fine sand	SM	A-2	0	0	100	100	80-95	20-35	---	NP
	7-25	Loamy fine sand	SM	A-2	0	0	100	100	85-95	20-35	---	NP
	25-54	Fine sandy loam, very fine sandy loam	SC-SM	A-4	0	0	95-100	90-100	75-90	35-50	20-25	5-10
	54-66	Loamy fine sand, fine sandy loam	SC-SM, SM	A-2, A-4	0	0	95-100	90-100	75-90	20-40	15-25	NP-10
514: Aneth-----	0-9	Loamy fine sand	SM	A-2	0	0	100	100	80-95	20-35	---	NP
	9-33	Loamy fine sand	SM	A-2	0	0	100	100	85-95	20-35	---	NP
	33-51	Fine sandy loam, very fine sandy loam	SC-SM	A-4	0	0	95-100	90-100	75-90	35-50	20-25	5-10
	51-70	Loamy fine sand, fine sandy loam	SC-SM, SM	A-2, A-4	0	0	95-100	90-100	75-90	20-40	15-25	NP-10
515: Piute-----	0-3	Gravelly loamy fine sand	SM	A-2	0	0	80-85	70-75	65-70	20-35	---	NP
	3-7	Fine sand, loamy fine sand	SM	A-2	0	0	100	100	80-95	10-25	---	NP
	7-17	Unweathered bedrock			---	---	---	---	---	---	---	---
Bluechief-----	0-5	Loamy fine sand	SM	A-2	0	0	100	100	85-95	20-30	---	NP
	5-11	Very fine sandy loam, fine sandy loam	ML, SM	A-4	0	0	100	100	85-95	40-55	15-20	NP-5
	11-22	Fine sandy loam	CL-ML, SC-SM	A-4	0	0	95-100	90-100	80-90	40-55	20-25	5-10
	22-29	Fine sandy loam, very fine sandy loam	CL-ML, SC-SM	A-4	0	0	95-100	90-100	80-90	45-60	20-25	5-10
	29-39	Unweathered bedrock			---	---	---	---	---	---	---	---

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
515: Rock outcrop----	0-80	Unweathered bedrock			---	---	---	---	---	---	---	---
516: Kaito-----	0-3	Extremely gravelly fine sandy loam	GC-GM	A-2	15-25	10-25	25-40	20-35	15-30	5-20	20-25	5-10
	3-10	Gravelly fine sandy loam, gravelly very fine sandy loam	CL-ML, SC-SM	A-4	0	10-15	75-90	70-85	65-80	40-55	20-25	5-10
	10-24	Very fine sandy loam, fine sandy loam, loam	CL-ML, SC-SM	A-4, A-6	0	0-10	90-100	85-100	75-90	45-60	20-30	5-10
	24-47	Fine sandy loam	SC-SM	A-2	0	0	100	100	90-100	20-35	15-25	5-10
	47-57	Weathered bedrock			---	---	---	---	---	---	---	---
Claysprings----	0-2	Extremely gravelly sandy clay loam	GC	A-2	25-40	10-15	25-45	20-40	15-30	10-25	30-35	10-15
	2-5	Clay	CH, CL	A-7	0	0	90-95	85-90	75-85	65-80	45-60	20-30
	5-16	Silty clay, clay	CH, CL	A-7	0	0	100	100	90-100	75-90	45-60	20-30
	16-26	Weathered bedrock			---	---	---	---	---	---	---	---
517: Moffat-----	0-6	Loamy fine sand	SM	A-2	0	0	90-100	85-100	80-95	20-35	15-20	NP-5
	6-28	Fine sandy loam, very fine sandy loam	SC-SM	A-4	0	0	95-100	90-100	85-95	40-50	20-25	5-10
	28-47	Fine sandy loam, loam	CL-ML, SC-SM	A-4	0	0	95-100	90-100	80-95	45-60	20-25	5-10
	47-65	Fine sandy loam, sandy clay loam	CL, CL-ML, SC-SM, SC	A-4, A-6	0	0	95-100	90-100	75-90	45-60	20-35	5-15

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
518:												
Tohatin-----	0-3	Loamy fine sand	SM	A-2	0	0-10	90-100	85-100	75-90	20-35	---	NP
	3-48	Loamy fine sand, fine sand	SM	A-2	0	0	90-100	85-100	80-95	10-25	---	NP
	48-80	Fine sandy loam, loamy fine sand	SM	A-2, A-4	0	0	100	100	85-100	25-40	15-25	NP-5
Sheppard-----	0-8	Loamy fine sand	SM	A-2	0	0	100	100	80-95	20-35	---	NP
	8-80	Loamy fine sand, fine sand	SM	A-2	0	0	100	100	75-90	15-30	---	NP
519:												
Shumbegay-----	0-2	Loamy fine sand	SM	A-2	0	0	100	100	80-95	20-35	---	NP
	2-6	Loamy fine sand	SM	A-2	0	0	100	100	90-100	20-35	---	NP
	6-10	Fine sand, loamy fine sand	SM	A-2	0	0	100	100	90-100	15-25	---	NP
	10-80	Stratified fine sand to silt loam	SM	A-2	0	0	100	100	90-100	20-30	---	NP
520:												
Rock outcrop----	0-80	Unweathered bedrock			---	---	---	---	---	---	---	---
Needle-----	0-5	Fine sand	SM	A-2	0	0	100	100	85-95	10-20	---	NP
	5-15	Fine sand, loamy fine sand	SM	A-2	0	0	100	100	80-90	10-25	---	NP
	15-19	Unweathered bedrock			---	---	---	---	---	---	---	---

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
521: Sandbench-----	0-11	Fine sand	SM	A-2	0	0	100	100	85-95	10-25	---	NP
	11-17	Loamy fine sand, fine sand	SM	A-2	0	0	95-100	90-100	85-95	10-25	---	NP
	17-31	Loamy fine sand, fine sand	SM	A-2	0	0	95-100	90-100	85-95	10-25	---	NP
	31-41	Unweathered bedrock			---	---	---	---	---	---	---	---
Sheppard-----	0-4	Fine sand	SM	A-2	0	0	100	100	75-90	10-25	---	NP
	4-61	Loamy fine sand, fine sand	SM	A-2	0	0	100	100	75-90	15-30	---	NP
522: Pennell-----	0-5	Loamy fine sand	SM	A-2	0	0	85-95	80-90	70-80	20-35	---	NP
	5-10	Fine sandy loam	CL-ML, SC-SM	A-4	0	0	90-100	85-95	75-85	40-55	20-25	5-10
	10-18	Gravelly sandy loam, gravelly loam	SC-SM	A-4	0	10-15	70-80	65-75	55-65	35-50	20-30	5-10
	18-22	Unweathered bedrock			---	---	---	---	---	---	---	---
523: Tyende-----	0-6	Loamy fine sand	SM	A-2	0	0	100	100	85-95	20-35	---	NP
	6-10	Fine sandy loam	SC-SM	A-4	0	0	100	100	90-100	40-50	20-25	5-10
	10-14	Sandy clay loam, very fine sandy loam	CL	A-6	0	0	100	100	90-100	50-60	25-35	10-15
	14-37	Very fine sandy loam, fine sandy loam	CL-ML, SC-SM	A-4	0	0	100	100	85-95	45-55	20-25	5-10
	37-41	Weathered bedrock			---	---	---	---	---	---	---	---

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10	4	10	40	200		
					inches	inches						
	In				Pct	Pct					Pct	
523:												
Aneth-----	0-2	Loamy fine sand	SM	A-2	0	0	100	100	80-95	20-35	---	NP
	2-32	Loamy fine sand	SM	A-2	0	0	100	100	85-95	20-35	---	NP
	32-63	Fine sandy loam, very fine sandy loam	SC-SM	A-4	0	0	95-100	90-100	75-90	35-50	20-25	5-10
Shumbegay-----	0-1	Loamy fine sand	SM	A-2	0	0	100	100	80-95	20-35	---	NP
	1-5	Loamy fine sand	SM	A-2	0	0	100	100	90-100	20-35	---	NP
	5-80	Fine sand, loamy fine sand	SM	A-2	0	0	100	100	90-100	15-25	---	NP
524:												
Uzaneva-----	0-1	Clay loam	CL	A-6, A-7	0	0	100	100	95-100	70-85	35-45	15-20
	1-13	Clay, clay loam	CH, CL	A-7	0	0	100	100	95-100	70-85	40-60	20-30
	13-25	Silty clay loam, silty clay, clay	CH, CL	A-7	0	0	100	100	95-100	80-95	40-60	20-30
	25-80	Stratified sandy loam to silty clay	CL	A-6	0	0	100	100	85-100	65-80	35-40	15-20
525:												
Rock outcrop----	0-80	Unweathered bedrock			---	---	---	---	---	---	---	---
526:												
Sandbench-----	0-8	Fine sand	SM	A-2	0	0	100	100	85-95	10-25	---	NP
	8-19	Loamy fine sand, fine sand	SM	A-2	0	0	95-100	95-100	85-95	10-25	---	NP
	19-37	Loamy fine sand, fine sand	SM	A-2	0	0	95-100	95-100	85-95	10-25	---	NP
	37-41	Unweathered bedrock			---	---	---	---	---	---	---	---
Rock outcrop----	0-80	Unweathered bedrock			---	---	---	---	---	---	---	---

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
526: Piute, cool-----	0-3	Gravelly loamy fine sand	SM	A-2	0	0	80-85	70-75	65-70	20-35	---	NP
	3-8	Fine sand, loamy fine sand	SM	A-2	0	0	100	100	80-95	10-25	---	NP
	8-12	Unweathered bedrock			---	---	---	---	---	---	---	---
527: Outpost-----	0-3	Sandy clay loam	CL	A-6	0	0	100	100	90-100	50-60	30-40	10-15
	3-35	Clay loam, silty clay loam, silty clay	CH, CL	A-7	0	0	100	100	95-100	80-90	40-60	15-30
	35-58	Stratified sandy loam to silt loam	SM	A-2, A-4	0	0	100	100	80-90	25-45	15-25	NP-5
	58-80	Stratified loamy sand to silty clay loam	SC, SC-SM	A-4, A-6	0	0	100	100	85-95	35-50	25-35	5-15
528: Mack-----	0-3	Fine sandy loam	SC-SM	A-2, A-4	0	0	90-100	85-100	80-95	30-45	15-25	5-10
	3-13	Fine sandy loam, sandy clay loam	CL, SC	A-6	0	0	90-100	85-100	80-95	40-55	25-35	10-15
	13-51	Sandy clay loam, loam, sandy loam	CL, SC	A-6	0	0	90-100	85-100	80-95	45-60	25-35	10-15
	51-65	Sandy loam	SC-SM	A-2, A-4	0	0	90-100	85-100	65-80	30-45	15-25	5-10

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10						
					inches	inches	4	10	40	200		
	In				Pct	Pct					Pct	
600: Kunz-----	0-4	Very flaggy fine sandy loam	SC-SM	A-2, A-4	10-30	30-40	60-85	55-80	45-70	30-45	20-25	5-10
	4-23	Gravelly sandy clay loam, sandy clay loam	SC	A-6	0	0-10	80-95	75-90	55-70	35-50	30-35	10-15
	23-38	Fine sandy loam	CL-ML, SC-SM	A-4	0-15	0	95-100	90-100	75-90	45-60	25-30	5-10
	38-66	Sandy loam, fine sandy loam	SM	A-2, A-4	0-15	0-10	95-100	90-100	70-85	35-50	20-25	NP-5
Yahmore-----	0-5	Fine sandy loam	SC-SM	A-2	0	0	100	100	65-80	20-35	20-25	5-10
	5-33	Fine sandy loam, sandy loam	SC-SM	A-4	0	0	100	100	60-75	35-50	25-30	5-10
	33-64	Sandy clay loam, sandy loam	CL, CL-ML, SC-SM, SC	A-4, A-6	0	0	100	100	50-70	40-55	20-35	5-15
602: Bostwick-----	0-10	Fine sandy loam	SC-SM	A-4	0	0	100	100	80-95	35-50	20-25	5-10
	10-51	Sandy clay loam, clay loam	CL	A-6	0	0	100	100	85-100	50-70	30-40	10-20
	51-65	Fine sandy loam, sandy loam	SC-SM	A-4	0	0	100	100	80-95	35-50	20-25	5-10
Canburn-----	0-10	Silt loam	CL	A-6	0	0	100	100	80-95	70-85	25-35	10-15
	10-31	Silty clay loam, clay loam	CL	A-6	0	0	100	90-100	75-90	65-80	35-40	15-20
	31-43	Fine sandy loam	SC-SM	A-4	0	0	100	90-100	75-85	35-50	20-25	5-10
	43-65	Stratified loamy sand to clay loam	CL, SC	A-2, A-6, A-4	0	0	100	100	65-80	25-60	25-35	10-15

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10	4	10	40	200		
					inches	inches						
	In				Pct	Pct					Pct	
604: Yahmore-----	0-3	Sandy loam	SC-SM	A-2	0	0	100	100	65-80	20-35	20-25	5-10
	3-35	Fine sandy loam, sandy loam	SC-SM	A-4	0	0	100	100	60-75	35-50	25-30	5-10
	35-64	Sandy clay loam, sandy loam	CL-ML, CL, SC, SC-SM	A-4, A-6	0	0	100	100	50-70	40-55	20-35	5-15
Sandark-----	0-5	Loamy fine sand	SM	A-2	0	0	100	100	80-90	20-30	---	---
	5-36	Loamy fine sand, fine sand, loamy sand	SM	A-2	0	0	100	100	70-85	15-30	---	---
	36-66	Fine sand, loamy sand, loamy fine sand	SM	A-2	0	0	100	100	70-85	15-30	---	---
606: Narbona-----	0-4	Very flaggy sand	SM	A-2	15-30	30-50	80-90	75-85	55-70	10-20	---	NP
	4-22	Very channery sand, very channery loamy sand	SM	A-1, A-2	10-25	15-25	70-80	45-65	45-60	10-25	---	NP
	22-66	Very stony sandy clay loam, very stony sandy loam	GC, SC	A-2, A-6	25-40	10-25	60-80	50-70	40-60	30-45	25-35	10-15
Deza-----	0-4	Sand	SM	A-2	0	0	95-100	90-100	75-85	15-30	---	NP
	4-31	Sand	SM	A-2	0	0	90-95	85-90	70-75	10-25	---	NP
	31-62	Sand, loamy sand	SM	A-2	0	0	90-95	85-90	70-75	15-30	---	NP

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10	4	10	40	200		
					inches	inches						
	In				Pct	Pct					Pct	
608: Narbona-----	0-7	Very flaggy loamy sand	SM	A-2	15-30	30-50	80-90	75-85	55-70	15-25	---	NP
	7-28	Very channery sand, very channery loamy sand	SM	A-1, A-2	10-25	15-25	70-80	45-65	45-60	10-25	---	NP
	28-63	Very stony sandy clay loam, very stony sandy loam	GC, SC	A-2, A-6	25-40	10-25	60-80	50-70	40-60	30-45	25-35	10-15
Zilditloi-----	0-7	Loamy sand	SM	A-2	0-5	0-10	95-100	90-100	65-80	15-30	---	---
	7-31	Sand, fine sand, loamy fine sand	SM	A-2	0	0	100	100	65-80	10-25	---	---
	31-70	Sand, fine sand, loamy fine sand	SM	A-2	0	0	100	100	65-80	10-25	---	---
610: Kunz-----	0-6	Fine sandy loam	SC-SM	A-4	0	0	100	100	85-95	35-50	20-25	5-10
	6-26	Sandy clay loam	CL	A-6	0	0	100	100	85-95	50-65	30-35	10-15
	26-70	Clay loam, sandy clay loam	CL, SC	A-6	0	0	100	100	75-90	40-60	30-40	10-15
Xankey-----	0-6	Very cobbly loam	CL, SC	A-6	10-30	40-45	75-90	70-85	55-70	45-60	25-30	10-15
	6-30	Very cobbly sandy clay loam, very stony sandy clay loam	CL	A-6	25-40	30-45	85-100	80-100	65-75	50-65	30-35	10-15
	30-63	Sandy loam, cobbly sandy loam	SC-SM	A-4	0	10-15	80-95	75-90	60-75	35-50	20-25	5-10

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
612: Xankey-----	0-6	Very cobbly loam	CL, SC	A-6	10-30	40-45	75-90	70-85	55-70	45-60	25-30	10-15
	6-29	Very cobbly sandy clay loam, very stony sandy clay loam	CL	A-6	25-40	30-45	85-100	80-100	65-75	50-65	30-35	10-15
	29-64	Sandy loam, cobbly sandy loam	SC-SM	A-4	0	10-15	80-95	75-90	60-75	35-50	20-25	5-10
614: Kunz-----	0-2	Very flaggy loam	GC-GM, SC-SM	A-4	0-10	30-40	60-80	50-70	45-65	35-50	20-25	5-10
	2-6	Flaggy loam	CL-ML, SC-SM	A-4	0	15-25	80-95	75-90	70-85	45-60	20-25	5-10
	6-28	Clay loam, sandy clay loam	CL, SC	A-6	0	0	95-100	90-100	70-80	45-60	35-40	15-20
	28-65	Sandy clay loam	SC	A-6	0	0	95-100	90-100	70-80	35-50	30-35	10-15
Tuntsa-----	0-9	Fine sandy loam	CL-ML, SC-SM	A-4	0	0	95-100	90-100	85-95	40-55	15-25	5-10
	9-45	Fine sandy loam, loam	CL-ML, SC-SM	A-4	0	0	95-100	90-100	85-95	45-55	15-25	5-10
	45-63	Fine sandy loam, loam	CL-ML, SC-SM	A-4	0	0	95-100	90-100	85-95	45-55	15-25	5-10
Yahmore-----	0-9	Loam	CL-ML	A-4	0	0	100	100	75-90	50-75	20-25	5-10
	9-24	Sandy loam, fine sandy loam	SC-SM	A-4	0	0	100	100	60-75	35-50	25-30	5-10
	24-64	Sandy loam, sandy clay loam	CL-ML, CL, SC, SC-SM	A-4, A-6	0	0	100	100	50-70	40-55	20-35	5-15

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10						
					inches	inches	4	10	40	200		
	In				Pct	Pct					Pct	
616: Ligai-----	0-2	Extremely flaggy very fine sandy loam	GC-GM	A-2	10-15	50-60	20-45	15-40	15-35	10-30	20-25	5-10
	2-7	Very flaggy sandy clay loam, very cobbly sandy clay loam	GC	A-2, A-6	0-15	40-50	45-65	40-60	30-50	25-45	30-35	10-15
	7-25	Very flaggy sandy clay loam, extremely flaggy sandy clay loam	GC	A-2, A-6	0-15	40-60	40-65	35-60	30-55	20-40	30-35	10-15
	25-35	Unweathered bedrock			---	---	---	---	---	---	---	---
Pastorpeak----	0-4	Very cobbly very fine sandy loam	GC-GM, SC-SM	A-2, A-4	10-25	40-45	65-85	60-80	55-75	30-50	20-25	5-10
	4-38	Very cobbly loam, very cobbly sandy clay loam	GC, SC	A-2, A-6	0-10	40-50	60-85	55-80	50-75	30-50	25-35	10-15
	38-64	Extremely cobbly sandy loam, extremely cobbly loam	GC	A-2	10-15	55-65	40-60	35-55	25-45	15-35	25-35	10-15
	64-80	Fragmental material	GC-GM, GP-GC	A-2	10-15	70-75	20-40	15-35	10-25	5-20	20-25	5-10
Rock outcrop----	0-80	Unweathered bedrock			---	---	---	---	---	---	---	---

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10						
					inches	inches	4	10	40	200		
	In				Pct	Pct					Pct	
618: Zibetod-----	0-2	Extremely cobbly very fine sandy loam	GM	A-1, A-2	10-25	45-50	35-50	30-45	25-40	20-35	15-25	NP-5
	2-14	Very cobbly very fine sandy loam, very cobbly fine sandy loam	GC-GM, SC-SM	A-4	10-15	30-50	65-80	60-75	55-70	35-50	20-25	5-10
	14-24	Unweathered bedrock			---	---	---	---	---	---	---	---
Bigpaw-----	0-5	Loam	CL-ML	A-4	0	0	100	100	95-100	80-95	25-30	5-10
	5-48	Loam	CL	A-6	0	0	95-100	90-100	90-100	85-95	25-35	10-15
	48-57	Stony sandy clay loam, sandy clay loam	CL, SC	A-6	0-25	0-10	85-95	80-90	70-80	45-60	30-35	10-15
	57-65	Stratified very gravelly fine sandy loam to sandy clay loam	CL, GC, SC	A-6	0-10	0-15	70-90	65-85	55-70	40-55	25-30	10-15
700: Akhoni-----	0-3	Fine sandy loam	SC-SM, SM	A-2, A-4	0	0-10	95-100	90-100	80-90	30-45	---	NP-10
	3-17	Fine sandy loam, sandy loam	SC-SM, SM	A-2, A-4	0	0-10	90-100	85-95	75-85	25-40	15-25	NP-10
	17-27	Unweathered bedrock			---	---	---	---	---	---	---	---

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10	4	10	40	200		
					inches	inches						
	In				Pct	Pct					Pct	
700: Retaw-----	0-3	Muck	OL	A-8	0	0	---	---	---	---	---	---
	3-8	Mucky silt loam	CL	A-6	0	0	100	100	80-95	75-90	25-35	10-15
	8-13	Mucky silty clay loam, mucky clay loam, mucky silty clay	CL	A-7	0	0	100	100	80-95	70-85	40-50	20-25
	13-33	Stratified fine sandy loam to silty clay	CL	A-6, A-7	0	0	95-100	90-100	70-90	65-85	25-50	10-25
	33-70	Stratified loamy sand to sandy clay loam	CL-ML, CL, SC, SC-SM	A-4, A-6	0	0	95-100	90-100	50-70	35-55	15-30	5-15
702: Bikeyah-----	0-5	Loam	CL-ML, SC-SM	A-4	0	0	95-100	90-100	80-95	45-60	15-20	5-10
	5-14	Loam, fine sandy loam	CL-ML, SC-SM	A-4	0	0	95-100	90-100	80-95	40-55	15-20	5-10
	14-29	Fine sandy loam, sandy loam	SC-SM	A-4	0	0	95-100	90-100	70-85	35-50	15-20	5-10
	29-65	Sandy loam, fine sandy loam, sandy clay loam	SC, SC-SM	A-4, A-6	0	0	95-100	90-100	70-85	35-50	15-30	5-15
Berland-----	0-2	Loam	CL	A-6	0	0-10	90-100	85-100	80-95	60-75	25-30	10-15
	2-9	Loam, sandy clay loam, clay loam	CL	A-6	0	0	80-100	75-100	70-85	50-70	25-40	10-20
	9-19	Unweathered bedrock			---	---	---	---	---	---	---	---
704: Klizhin-----	0-4	Fine sandy loam	SC-SM, SM	A-2, A-4	0	0	95-100	90-100	75-85	30-45	15-25	NP-10
	4-49	Fine sandy loam	SC-SM, SM	A-2, A-4	0	0	90-95	85-90	70-75	25-40	15-25	NP-10
	49-56	Loamy sand	SM	A-2	0	0	80-95	75-90	50-65	10-25	---	NP
	56-64	Sandy loam, fine sandy loam	SC-SM, SM	A-2, A-4	0	0	90-95	85-90	70-75	25-40	15-25	NP-10

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
704: Captom-----	0-8	Very flaggy loamy sand	SM	A-2	10-15	25-40	65-80	60-75	50-65	15-30	---	NP
	8-13	Very channery loamy sand, very channery loamy fine sand	GM, SM	A-1, A-2	0-10	25-40	55-75	55-70	40-55	15-30	---	NP
	13-32	Channery loamy sand, channery loamy fine sand	SM	A-2	0	0-10	65-80	60-75	50-65	15-30	---	NP
	32-43	Sandy clay loam, sandy loam	SC	A-6	0	0-10	80-100	75-100	65-80	35-50	25-30	10-15
	43-58	Sandy loam, fine sandy loam	SC-SM	A-2, A-4	0	0	100	100	75-90	25-40	20-25	5-10
	58-68	Weathered bedrock			---	---	---	---	---	---	---	---
706: Todacheene-----	0-2	Loam	CL-ML	A-4	0	0	100	100	95-100	55-65	20-25	5-10
	2-18	Loam, sandy clay loam	CL	A-6	0	0	100	100	95-100	60-70	25-35	10-15
	18-37	Sandy clay loam, fine sandy loam, loam	CL	A-6	0	0	100	100	90-100	50-60	25-35	10-15
	37-80	Gravelly sandy loam, very gravelly coarse sandy loam, gravelly sandy clay loam	GC-GM, SC, GC, SC-SM	A-2, A-6, A-4	0-15	10-15	50-75	40-65	25-50	15-40	20-35	5-15

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10						
					inches	inches	4	10	40	200		
	In				Pct	Pct					Pct	
706: Viewpoint-----	0-3	Gravelly loam	SC-SM	A-2, A-4	0-10	0-10	65-80	60-75	45-60	30-45	20-25	5-10
	3-7	Gravelly sandy clay loam, gravelly loam	GC, SC	A-6	0	0-15	60-70	55-65	40-50	35-45	25-35	10-15
	7-17	Cobbly sandy clay loam, gravelly clay loam, gravelly loam	GC, SC	A-6	0-10	0-25	60-75	55-70	40-50	35-45	25-40	10-20
	17-27	Unweathered bedrock			---	---	---	---	---	---	---	---
Owlspring-----	0-5	Loam	CL-ML	A-4	0	0	95-100	90-100	80-90	70-80	25-30	5-10
	5-25	Loam, clay loam	CL	A-6	0	0	95-100	90-100	85-95	80-90	30-40	10-20
	25-43	Sandy clay loam	CL	A-6	0	0-10	95-100	90-100	80-90	70-80	30-40	10-20
	43-66	Fine sandy loam, sandy loam	SC-SM	A-4	0	0-10	90-95	85-90	70-80	40-50	25-30	5-10
	66-72	Gravelly sandy loam, gravelly fine sandy loam	SC-SM	A-2, A-4	0	0-15	65-85	60-80	45-65	25-45	15-25	5-10
	72-81	Very fine sandy loam, fine sandy loam	CL-ML, SC-SM	A-4	0	0	100	100	85-95	40-55	15-25	5-10
708: Tunitcha-----	0-5	Very flaggy sandy loam	GC-GM, SC-SM	A-4	0-10	30-40	50-75	45-70	45-65	35-50	15-20	5-10
	5-8	Flaggy sandy loam	SC-SM	A-4	0	15-40	85-95	80-90	50-60	35-50	15-20	5-10
	8-38	Sandy clay loam	CL, SC	A-6	0	0-10	90-100	85-100	75-90	40-55	25-30	10-15
	38-57	Sandy loam, fine sandy loam	SC-SM	A-2, A-4	0	0	100	100	75-90	30-45	15-20	5-10
	57-67	Weathered bedrock			---	---	---	---	---	---	---	---

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10						
					inches	inches	4	10	40	200		
	In				Pct	Pct					Pct	
708: Bangston-----	0-7	Loamy sand	SM	A-1, A-2	0	0	100	100	40-55	20-35	---	NP
	7-26	Loamy sand, loamy fine sand	SM	A-1, A-2	0	0	100	100	40-55	20-35	---	NP
	26-43	Flaggy loamy sand, flaggy loamy fine sand, loamy sand	SM	A-1, A-2	0	10-25	80-100	75-95	30-45	15-30	---	NP
	43-66	Very flaggy loamy sand, very flaggy loamy fine sand	GM, SP-SM, GP-GM, SM	A-1, A-2	0	30-50	50-70	45-65	20-35	5-20	---	NP
710: Akhoni-----	0-2	Fine sandy loam	SC-SM, SM	A-2, A-4	0	0-10	95-100	90-100	80-90	30-45	15-25	NP-10
	2-13	Fine sandy loam, sandy loam	SC-SM, SM	A-2, A-4	0	0-10	90-100	85-95	75-85	25-40	15-25	NP-10
	13-17	Unweathered bedrock			---	---	---	---	---	---	---	---
Klizhin-----	0-7	Fine sandy loam	SC-SM, SM	A-2, A-4	0	0	95-100	90-100	75-85	30-45	15-25	NP-10
	7-22	Fine sandy loam	SC-SM, SM	A-2, A-4	0	0	95-100	90-100	75-85	30-45	15-25	NP-10
	22-45	Sandy loam, fine sandy loam	SC-SM, SM	A-2, A-4	0	0-10	95-100	85-90	70-75	25-40	15-25	NP-10
	45-55	Unweathered bedrock			---	---	---	---	---	---	---	---

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
712: Sonsela-----	0-4	Very cobbly fine sandy loam	GC-GM, SC-SM	A-2	10-25	25-30	55-70	50-65	45-60	20-35	20-25	5-10
	4-9	Gravelly fine sandy loam, gravelly loam	SC-SM	A-4	0-10	10-15	70-90	65-85	60-80	35-50	20-25	5-10
	9-26	Very gravelly fine sandy loam, very gravelly sandy clay loam, very gravelly sandy loam	GC	A-2	0-15	15-25	45-65	40-60	35-55	15-35	25-35	10-15
	26-48	Very cobbly sandy clay loam, very cobbly fine sandy loam, very cobbly sandy loam	GC, SC	A-2, A-6	0-10	25-40	55-75	45-65	40-60	20-40	25-35	10-15
	48-70	Extremely cobbly fine sandy loam, extremely cobbly sandy clay loam	GC	A-2	10-15	45-50	30-45	25-40	20-35	10-25	25-35	10-15
Washpass-----	0-12	Fine sandy loam	SM	A-4	0-10	0-10	85-100	80-100	65-85	35-50	15-20	NP-5
	12-36	Fine sandy loam, gravelly fine sandy loam, gravelly sandy loam	SC-SM	A-4	0-10	0-15	70-90	65-85	55-75	35-50	20-25	5-10
	36-57	Very gravelly fine sandy loam, very gravelly sandy loam	SC-SM	A-2	0-10	10-25	40-60	35-55	25-45	10-30	20-25	5-10
	57-85	Gravelly fine sandy loam, gravelly sandy loam, very fine sandy loam	SC-SM	A-2, A-4	0-10	0-10	75-95	70-90	55-75	30-50	20-25	5-10

Table 14.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
712: Viewpoint-----	0-3	Very gravelly loam	GC-GM	A-2	0-15	15-25	45-65	40-60	25-45	15-35	20-25	5-10
	3-9	Gravelly loam, gravelly sandy clay loam	GC, SC	A-6	0	0-15	60-70	55-65	40-50	35-45	25-35	10-15
	9-14	Cobbly sandy clay loam, gravelly clay loam, gravelly loam	GC, SC	A-6	0-10	0-25	60-75	55-70	40-50	35-45	25-40	10-20
	14-18	Unweathered bedrock			---	---	---	---	---	---	---	---
W: Water-----	---	---	---	---	---	---	---	---	---	---	---	---

Table 15.--Physical Properties of the Soils

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodibility index" apply only to the surface layer. Absence of an entry indicates that data were not estimated.)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
100: Werito-----	0-3	18-27	1.25-1.35	0.60-2.00	0.14-0.17	0.0-2.9	0.4-0.6	.37	.37	2	4L	86
	3-7	27-40	1.40-1.50	0.20-0.60	0.16-0.20	3.0-5.9	0.4-0.6	.32	.32			
	7-17	35-40	1.40-1.50	0.06-0.20	0.16-0.20	3.0-5.9	0.4-0.6	.32	.32			
	17-22	35-55	1.40-1.50	0.06-0.20	0.10-0.14	3.0-5.9	0.3-0.5	.24	.24			
	22-34	35-55	1.50-1.60	0.06-0.20	0.11-0.15	3.0-5.9	0.3-0.5	.24	.24			
	34-44	---	---	---	---	---	---	---	---			
102: Blackston-----	0-3	10-18	1.50-1.60	2.00-6.00	0.07-0.09	0.0-2.9	0.4-0.6	.15	.24	5	5	56
	3-9	10-18	1.50-1.60	2.00-6.00	0.11-0.13	0.0-2.9	0.3-0.5	.24	.24			
	9-15	20-35	1.50-1.60	0.60-2.00	0.10-0.12	3.0-5.9	0.3-0.5	.15	.32			
	15-35	10-18	1.45-1.55	6.00-20.00	0.03-0.06	0.0-2.9	0.2-0.4	.05	.20			
	35-70	0-8	1.45-1.55	20.00-20.00	0.01-0.03	0.0-2.9	0.2-0.4	.02	.15			
Camac-----	0-3	10-18	1.40-1.50	2.00-6.00	0.06-0.08	0.0-2.9	0.4-0.6	.10	.28	2	6	48
	3-17	15-27	1.40-1.50	0.60-2.00	0.09-0.13	0.0-2.9	0.3-0.5	.15	.32			
	17-31	18-35	1.45-1.55	0.20-0.60	0.12-0.16	3.0-5.9	0.2-0.4	.32	.32			
	31-41	---	---	---	---	---	---	---	---			
Rock outcrop-----	0-80	---	---	---	---	---	---	---	---	-	---	---
105: Hamburn-----	0-3	27-35	1.40-1.50	0.20-0.60	0.19-0.21	3.0-5.9	1.0-2.0	.32	.32	5	4L	86
	3-9	15-27	1.45-1.55	0.20-0.60	0.14-0.19	3.0-5.9	0.8-2.0	.28	.28			
	9-24	27-35	1.40-1.50	0.20-0.60	0.08-0.10	3.0-5.9	0.3-0.8	.32	.32			
	24-70	27-35	1.40-1.50	0.20-0.60	0.04-0.07	3.0-5.9	0.3-0.5	.32	.32			
107: Tocito-----	0-2	12-18	1.25-1.35	0.60-2.00	0.15-0.17	0.0-2.9	0.4-0.6	.55	.55	5	3	86
	2-16	27-35	1.40-1.50	0.20-0.60	0.16-0.20	0.0-2.9	0.3-0.5	.32	.32			
	16-63	18-25	1.40-1.50	0.60-2.00	0.12-0.15	0.0-2.9	0.2-0.5	.43	.43			
Gullied land-----	0-3	18-27	---	0.60-2.00	0.19-0.21	0.0-2.9	0.2-0.5	.43	.43	-	4L	86
	3-80	18-27	---	0.60-2.00	0.12-0.15	0.0-2.9	0.2-0.5	.43	.43			

Table 15.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
110: Brimhall-----	0-2	4-8	1.50-1.60	6.00-20.00	0.08-0.09	0.0-2.9	0.2-0.6	.20	.20	3	2	134
	2-21	8-18	1.50-1.60	2.00-6.00	0.12-0.15	0.0-2.9	0.2-0.4	.28	.28			
	21-29	8-18	1.50-1.60	2.00-6.00	0.12-0.15	0.0-2.9	0.2-0.4	.28	.28			
	29-49	---	1.50-1.60	2.00-6.00	0.07-0.09	0.0-2.9	0.2-0.4	---	---			
	49-59	---	---	---	---	---	---	---	---			
Benally-----	0-1	20-25	1.20-1.30	0.60-2.00	0.12-0.14	0.0-2.9	0.3-0.5	.32	.32	3	5	56
	1-11	27-35	1.40-1.50	0.14-0.57	0.09-0.13	---	0.2-0.5	.32	.32			
	11-31	27-35	1.40-1.50	0.20-0.60	0.08-0.12	3.0-5.9	0.2-0.4	.37	.37			
	31-52	20-30	1.40-1.50	0.60-2.00	0.05-0.08	0.0-2.9	0.1-0.3	.15	.32			
	52-62	---	---	---	---	---	---	---	---			
Genats-----	0-4	5-10	1.45-1.55	6.00-20.00	0.07-0.08	0.0-2.9	0.2-0.6	.10	.17	2	3	86
	4-13	35-55	1.45-1.55	0.06-0.20	0.14-0.16	3.0-5.9	0.4-0.6	.24	.28			
	13-27	35-55	1.45-1.55	0.06-0.20	0.08-0.11	3.0-5.9	0.3-0.5	.24	.28			
	27-37	---	---	---	---	---	---	---	---			
113: Gyptur-----	0-2	15-18	1.35-1.45	0.60-2.00	0.15-0.17	0.0-2.9	0.4-0.6	.55	.55	3	3	86
	2-5	27-35	1.20-1.30	0.20-0.60	0.19-0.21	3.0-5.9	0.2-0.5	.37	.37			
	5-17	---	1.20-1.30	0.20-0.60	0.09-0.17	0.0-2.9	0.2-0.5	---	---			
	17-46	18-35	1.20-1.30	0.20-0.60	0.04-0.05	3.0-5.9	0.2-0.5	.37	.37			
	46-56	---	---	---	---	---	---	---	---			
115: Denazar-----	0-14	1-4	1.50-1.60	6.00-20.00	0.05-0.07	0.0-2.9	0.3-0.5	.17	.17	3	1	250
	14-31	4-10	1.55-1.65	6.00-20.00	0.08-0.10	0.0-2.9	0.2-0.4	.20	.20			
	31-42	2-5	1.60-1.70	6.00-20.00	0.05-0.07	0.0-2.9	0.1-0.3	.17	.17			
	42-52	---	---	---	---	---	---	---	---			
Farb-----	0-6	0-5	1.40-1.50	6.00-20.00	0.04-0.07	0.0-2.9	0.2-0.5	.17	.17	1	1	250
	6-10	5-15	1.50-1.60	2.00-6.00	0.10-0.12	0.0-2.9	0.2-0.4	.15	.28			
	10-14	---	---	---	---	---	---	---	---			

Table 15.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
117: Badland-----	0-60	---	---	---	---	---	---	---	---	-	---	---
Rock outcrop-----	0-80	---	---	---	---	---	---	---	---	-	---	---
120: Nageezi-----	0-4	5-10	1.55-1.65	6.00-20.00	0.09-0.10	0.0-2.9	0.6-0.8	.20	.20	5	2	134
	4-14	10-15	1.45-1.55	2.00-6.00	0.12-0.14	0.0-2.9	0.4-0.7	.28	.28			
	14-32	10-18	1.50-1.60	2.00-6.00	0.13-0.16	0.0-2.9	0.5-1.0	.32	.32			
	32-48	10-18	1.60-1.70	2.00-6.00	0.09-0.11	0.0-2.9	0.2-0.5	.28	.28			
	48-64	5-10	1.55-1.65	6.00-20.00	0.04-0.06	0.0-2.9	0.1-0.3	.17	.17			
Denazar-----	0-11	1-5	1.50-1.60	6.00-20.00	0.05-0.07	0.0-2.9	0.3-0.5	.17	.17	5	1	220
	11-34	4-10	1.55-1.65	6.00-20.00	0.06-0.09	0.0-2.9	0.2-0.4	.17	.17			
	34-62	5-12	1.60-1.70	2.00-6.00	0.06-0.11	0.0-2.9	0.2-0.4	.20	.20			
122: Blueflat-----	0-2	20-27	1.15-1.25	0.60-2.00	0.14-0.16	0.0-2.9	0.3-0.6	.37	.37	2	4L	86
	2-7	30-40	1.40-1.50	0.20-0.60	0.14-0.16	3.0-5.9	0.2-0.5	.32	.32			
	7-14	---	1.35-1.45	0.20-0.60	0.13-0.15	---	0.2-0.5	---	---			
	14-27	35-45	1.45-1.55	0.06-0.20	0.07-0.10	3.0-5.9	0.2-0.5	.37	.37			
	27-37	---	---	---	---	---	---	---	---			
Notal-----	0-3	30-35	1.40-1.50	0.20-0.60	0.18-0.20	3.0-5.9	1.0-2.0	.32	.32	5	4L	86
	3-13	35-55	1.35-1.45	0.00-0.06	0.11-0.14	3.0-5.9	1.0-2.0	.28	.28			
	13-70	35-55	1.35-1.45	0.00-0.06	0.09-0.13	3.0-5.9	0.5-2.0	.28	.28			
125: Kimbeto-----	0-3	5-10	1.55-1.65	6.00-20.00	0.08-0.10	0.0-2.9	0.5-0.8	.20	.20	3	2	134
	3-10	10-18	1.45-1.55	2.00-6.00	0.12-0.15	0.0-2.9	0.5-0.8	.28	.28			
	10-18	18-27	1.50-1.60	0.60-2.00	0.13-0.15	0.0-2.9	0.5-0.8	.32	.32			
	18-29	15-20	1.50-1.60	2.00-6.00	0.10-0.12	0.0-2.9	0.3-0.8	.28	.28			
	29-42	5-18	1.55-1.65	2.00-6.00	0.05-0.10	0.0-2.9	0.2-0.4	.28	.28			
	42-52	---	---	---	---	---	---	---	---			
130: Badland-----	0-60	---	---	---	---	---	---	---	---	-	---	---

Table 15.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
130: Genats-----	0-3	10-20	1.45-1.55	0.60-2.00	0.15-0.17	0.0-2.9	0.2-0.6	.24	.37	2	5	56
	3-9	35-55	1.45-1.55	0.06-0.20	0.14-0.16	3.0-5.9	0.4-0.6	.24	.28			
	9-22	35-55	1.45-1.55	0.06-0.20	0.08-0.11	3.0-5.9	0.3-0.5	.24	.28			
	22-26	---	---	---	---	---	---	---	---			
133: Razito-----	0-10	0-5	1.40-1.50	20.00-20.00	0.06-0.08	0.0-2.9	0.2-0.4	.10	.10	5	1	250
	10-70	4-8	1.40-1.50	6.00-20.00	0.06-0.08	0.0-2.9	0.2-0.4	.17	.17			
135: Farb-----	0-2	5-10	1.50-1.60	6.00-20.00	0.06-0.09	0.0-2.9	0.2-0.5	.10	.17	1	3	86
	2-5	5-18	1.50-1.60	2.00-6.00	0.12-0.14	0.0-2.9	0.2-0.4	.28	.28			
	5-8	5-15	1.50-1.60	2.00-6.00	0.10-0.12	0.0-2.9	0.2-0.4	.15	.28			
	8-18	---	---	---	---	---	---	---	---			
Rock outcrop-----	0-80	---	---	---	---	---	---	---	---	-	---	---
Badland-----	0-60	---	---	---	---	---	---	---	---	-	---	---
137: Persayo-----	0-2	20-26	1.40-1.50	0.60-2.00	0.16-0.18	0.0-2.9	0.2-0.6	.37	.37	1	4L	86
	2-17	27-35	1.50-1.60	0.20-0.60	0.10-0.12	3.0-5.9	0.2-0.4	.32	.32			
	17-21	---	---	0.00-0.20	---	---	---	---	---			
137: Cairn-----	0-2	15-18	1.45-1.55	2.00-6.00	0.10-0.13	0.0-2.9	0.4-0.6	.15	.28	3	5	56
	2-9	25-35	1.40-1.50	0.60-2.00	0.14-0.20	3.0-5.9	0.3-0.5	.37	.37			
	9-19	18-25	1.40-1.50	0.60-2.00	0.06-0.10	0.0-2.9	0.3-0.5	.10	.37			
	19-46	---	1.50-1.60	2.00-6.00	0.03-0.05	0.0-2.9	0.2-0.4	---	---			
	46-56	---	---	---	---	---	---	---	---			
Patel-----	0-1	18-27	1.20-1.30	0.60-2.00	0.12-0.14	0.0-2.9	0.4-0.6	.10	.32	2	6	48
	1-8	40-50	1.35-1.45	0.06-0.20	0.13-0.17	3.0-5.9	0.4-0.6	.20	.20			
	8-24	35-45	1.45-1.55	0.20-0.60	0.09-0.10	3.0-5.9	0.3-0.5	.37	.37			
	24-37	27-40	1.45-1.55	0.20-0.60	0.09-0.11	3.0-5.9	0.2-0.4	.37	.37			
	37-47	---	---	---	---	---	---	---	---			

Table 15.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
140: Benally-----	0-4	4-10	1.45-1.55	6.00-20.00	0.06-0.08	0.0-2.9	0.2-0.4	.17	.17	5	2	134
	4-15	10-18	1.45-1.55	2.00-6.00	0.12-0.14	0.0-2.9	0.3-0.5	.28	.28			
	15-56	20-35	1.40-1.50	0.20-0.60	0.11-0.14	3.0-5.9	0.3-0.5	.32	.32			
	56-64	4-10	1.45-1.55	6.00-20.00	0.03-0.05	0.0-2.9	0.2-0.4	.17	.17			
142: Bebevar-----	0-4	2-8	1.55-1.65	6.00-20.00	0.05-0.08	0.0-2.9	0.2-0.5	.17	.17	5	2	134
	4-70	2-10	1.40-1.50	2.00-6.00	0.04-0.07	0.0-2.9	0.2-0.5	.10	.17			
Walrees-----	0-4	15-18	1.35-1.45	2.00-6.00	0.09-0.11	0.0-2.9	1.0-2.0	.28	.28	5	3	86
	4-30	18-27	1.30-1.40	0.20-0.60	0.10-0.13	3.0-5.9	0.5-1.0	.28	.28			
	30-62	0-5	1.35-1.45	20.00-20.00	0.02-0.04	0.0-2.9	0.2-0.5	.05	.10			
145: Razito-----	0-8	4-8	1.45-1.55	6.00-20.00	0.08-0.10	0.0-2.9	0.2-0.4	.20	.20	5	2	134
	8-62	4-8	1.40-1.50	6.00-20.00	0.06-0.08	0.0-2.9	0.2-0.4	.17	.17			
Huerfano-----	0-1	20-30	1.20-1.30	0.60-2.00	0.13-0.15	0.0-2.9	0.2-0.5	.32	.32	1	4L	86
	1-11	27-35	1.50-1.60	0.20-0.60	0.09-0.11	3.0-5.9	0.2-0.4	.32	.32			
	11-18	27-35	1.35-1.45	0.20-0.60	0.09-0.11	3.0-5.9	0.2-0.4	.32	.32			
	18-28	---	---	---	---	---	---	---	---			
147: Escavada-----	0-5	0-5	1.50-1.60	20.00-20.00	0.03-0.05	0.0-2.9	0.2-0.6	.10	.10	5	1	220
	5-70	2-10	1.50-1.60	2.00-6.00	0.02-0.05	0.0-2.9	0.2-0.6	.17	.17			
150: Chipeta-----	0-2	27-40	1.30-1.40	0.20-0.60	0.14-0.21	3.0-5.9	0.3-0.5	.37	.37	1	4L	86
	2-10	35-55	1.35-1.45	0.06-0.20	0.03-0.04	6.0-8.9	0.2-0.4	.24	.24			
	10-20	---	---	---	---	---	---	---	---			
Badland-----	0-60	---	---	---	---	---	---	---	---	-	---	---
Moncisco-----	0-2	20-25	1.20-1.30	0.60-2.00	0.04-0.06	0.0-2.9	0.4-0.6	.05	.28	1	8	0
	2-11	12-25	1.20-1.30	0.60-2.00	0.02-0.04	0.0-2.9	0.2-0.5	.05	.32			
	11-70	0-1	---	20.00-20.00	0.00-0.01	0.0-2.9	0.0-0.2	---	---			

Table 15.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
153:												
Green River-----	0-6	12-18	1.40-1.50	2.00-6.00	0.13-0.15	0.0-2.9	1.0-2.0	.28	.28	5	3	86
	6-10	18-25	1.35-1.45	0.60-2.00	0.16-0.18	0.0-2.9	1.0-2.0	.37	.37			
	10-55	14-18	1.45-1.55	0.60-2.00	0.11-0.15	0.0-2.9	0.4-0.8	.37	.37			
	55-68	5-10	1.50-1.60	2.00-6.00	0.08-0.10	0.0-2.9	0.2-0.5	.20	.20			
Green River, saline---	0-2	12-16	1.40-1.50	2.00-6.00	0.13-0.15	0.0-2.9	1.0-2.0	.28	.28	5	3	86
	2-16	12-18	1.45-1.55	2.00-6.00	0.09-0.11	0.0-2.9	0.5-1.0	.28	.28			
	16-52	10-18	1.50-1.60	0.60-2.00	0.04-0.07	0.0-2.9	0.4-0.6	.28	.28			
	52-66	5-10	1.50-1.60	2.00-6.00	0.07-0.09	0.0-2.9	0.2-0.5	.20	.20			
155:												
Mesa-----	0-2	15-20	1.45-1.55	2.00-6.00	0.12-0.14	0.0-2.9	0.4-0.8	.28	.28	5	3	86
	2-21	20-30	1.50-1.60	0.60-2.00	0.11-0.13	0.0-2.9	0.4-0.6	.32	.32			
	21-37	10-20	1.45-1.55	2.00-6.00	0.06-0.07	0.0-2.9	0.3-0.5	.10	.24			
	37-47	10-20	1.45-1.55	2.00-6.00	0.06-0.07	0.0-2.9	0.2-0.4	.10	.24			
	47-63	27-35	1.50-1.60	0.20-0.60	0.19-0.21	3.0-5.9	0.2-0.4	.32	.32			
157:												
Werjo, saline-----	0-4	18-25	1.20-1.30	0.60-2.00	0.12-0.14	0.0-2.9	0.5-1.0	.37	.37	5	4L	86
	4-12	18-25	1.35-1.45	0.60-2.00	0.03-0.04	0.0-2.9	0.5-1.0	.32	.32			
	12-66	20-27	1.35-1.45	0.20-0.60	0.04-0.05	0.0-2.9	0.6-0.8	.37	.37			
Werjo-----	0-6	18-25	1.20-1.30	0.60-2.00	0.16-0.18	0.0-2.9	0.5-1.0	.37	.37	5	4L	86
	6-12	18-25	1.35-1.45	0.60-2.00	0.13-0.16	0.0-2.9	0.5-1.0	.32	.32			
	12-70	20-27	1.35-1.45	0.20-0.60	0.12-0.14	0.0-2.9	0.6-0.8	.37	.37			
160:												
Notal-----	0-3	35-40	1.40-1.50	0.20-0.60	0.19-0.21	3.0-5.9	1.0-2.0	.37	.37	5	---	---
	3-11	35-55	1.35-1.45	0.00-0.06	0.11-0.14	3.0-5.9	1.0-2.0	.28	.28			
	11-70	35-55	1.35-1.45	0.00-0.06	0.09-0.13	3.0-5.9	0.5-2.0	.28	.28			
Escavada-----	0-2	5-15	1.40-1.50	0.60-2.00	0.15-0.17	0.0-2.9	0.2-0.6	.55	.55	5	3	86
	2-70	2-10	1.50-1.55	0.60-2.00	0.06-0.08	0.0-2.9	0.2-0.6	.17	.17			
Riverwash-----	0-6	0-1	---	6.00-20.00	0.03-0.04	0.0-2.9	0.0-0.1	.10	.10	-	1	220
	6-60	0-5	---	6.00-20.00	0.04-0.06	0.0-2.9	---	.10	.10			

Table 15.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
163: Werlog-----	0-2	27-35	1.40-1.50	0.20-0.60	0.04-0.06	3.0-5.9	0.5-1.0	.37	.37	5	4L	86
	2-12	18-27	1.35-1.45	0.60-2.00	0.08-0.10	0.0-2.9	0.5-1.0	.43	.43			
	12-65	27-35	1.40-1.50	0.20-0.60	0.14-0.16	3.0-5.9	0.6-0.8	.37	.37			
165: Jeddito-----	0-9	5-10	1.55-1.65	6.00-20.00	0.09-0.10	0.0-2.9	0.2-0.4	.20	.20	5	2	134
	9-27	8-15	1.50-1.60	6.00-20.00	0.08-0.10	0.0-2.9	---	.20	.20			
	27-60	10-18	1.50-1.60	0.60-2.00	0.09-0.11	0.0-2.9	---	.24	.24			
Escavada-----	0-4	5-15	1.40-1.50	0.60-2.00	0.15-0.17	0.0-2.9	0.2-0.6	.55	.55	5	3	86
	4-70	2-10	1.50-1.55	0.60-2.00	0.06-0.08	0.0-2.9	0.2-0.6	.17	.17			
167: Hoskay-----	0-2	18-27	1.20-1.30	0.60-2.00	0.12-0.14	0.0-2.9	0.4-0.6	.20	.37	5	5	56
	2-6	35-50	1.35-1.45	0.06-0.20	0.14-0.19	6.0-8.9	0.4-0.6	.24	.24			
	6-14	35-50	1.45-1.55	0.06-0.20	0.10-0.14	6.0-8.9	0.2-0.5	.24	.24			
	14-27	---	1.45-1.55	0.20-0.60	0.07-0.09	3.0-5.9	0.2-0.5	---	---			
	27-65	30-50	1.40-1.50	0.06-0.20	0.05-0.08	6.0-8.9	0.2-0.5	.20	.20			
Patel-----	0-2	27-35	1.20-1.30	0.20-0.60	0.13-0.18	3.0-5.9	0.4-0.6	.20	.37	2	5	56
	2-12	40-50	1.35-1.45	0.06-0.20	0.13-0.17	3.0-5.9	0.4-0.6	.20	.20			
	12-16	35-45	1.45-1.55	0.20-0.60	0.09-0.10	3.0-5.9	0.3-0.5	.37	.37			
	16-33	27-40	1.45-1.55	0.20-0.60	0.09-0.11	3.0-5.9	0.2-0.4	.37	.37			
	33-37	---	---	---	---	---	---	---	---			
Badland-----	0-60	---	---	---	---	---	---	---	---	-	---	---
170: Notal-----	0-2	20-30	1.30-1.40	0.60-2.00	0.10-0.12	0.0-2.9	1.0-2.0	.32	.32	5	4L	86
	2-24	35-55	1.35-1.45	0.00-0.06	0.11-0.14	3.0-5.9	1.0-2.0	.28	.28			
	24-66	35-55	1.35-1.45	0.00-0.06	0.09-0.13	3.0-5.9	0.5-2.0	.28	.28			
173: Shiprock-----	0-11	8-18	1.45-1.55	2.00-6.00	0.13-0.15	0.0-2.9	0.5-1.0	.28	.28	5	3	86
	11-43	12-18	1.45-1.55	2.00-6.00	0.14-0.16	0.0-2.9	0.4-0.6	.43	.43			
	43-70	8-14	1.45-1.55	2.00-6.00	0.14-0.16	0.0-2.9	0.3-0.5	.43	.43			

Table 15.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
175: Suwanee-----	0-6	18-27	1.25-1.35	0.60-2.00	0.16-0.18	0.0-2.9	0.4-0.8	.37	.37	5	4L	86
	6-64	18-35	1.40-1.50	0.20-0.60	0.14-0.19	3.0-5.9	0.2-0.6	.37	.37			
177: Notal-----	0-6	35-40	1.40-1.50	0.20-0.60	0.19-0.21	3.0-5.9	1.0-2.0	.37	.37	5	4L	86
	6-11	35-55	1.35-1.45	0.00-0.06	0.11-0.14	3.0-5.9	1.0-2.0	.28	.28			
	11-70	35-55	1.35-1.45	0.00-0.06	0.09-0.13	3.0-5.9	0.5-2.0	.28	.28			
180: Kimbeto-----	0-9	5-10	1.55-1.65	6.00-20.00	0.08-0.10	0.0-2.9	0.5-0.8	.20	.20	3	2	134
	9-17	10-18	1.45-1.55	2.00-6.00	0.12-0.15	0.0-2.9	0.5-0.8	.28	.28			
	17-25	18-27	1.50-1.60	0.60-2.00	0.13-0.15	0.0-2.9	0.5-0.8	.32	.32			
	25-32	15-20	1.50-1.60	2.00-6.00	0.10-0.12	0.0-2.9	0.3-0.8	.28	.28			
	32-44	5-18	1.55-1.65	2.00-6.00	0.05-0.10	0.0-2.9	0.2-0.4	.28	.28			
	44-48	---	---	---	---	---	---	---	---			
Huerfano-----	0-2	10-20	1.50-1.60	2.00-6.00	0.12-0.14	0.0-2.9	0.2-0.5	.28	.28	1	3	86
	2-9	27-35	1.50-1.60	0.20-0.60	0.09-0.11	3.0-5.9	0.2-0.4	.32	.32			
	9-18	27-35	1.35-1.45	0.20-0.60	0.09-0.11	3.0-5.9	0.2-0.4	.32	.32			
	18-22	---	---	---	---	---	---	---	---			
183: Gyptur-----	0-2	20-25	1.20-1.30	0.60-2.00	0.15-0.18	0.0-2.9	0.2-0.6	.37	.37	5	4L	86
	2-25	---	1.35-1.45	0.20-0.60	0.05-0.10	0.0-2.9	0.2-0.5	---	---			
	25-65	20-25	1.35-1.45	0.60-2.00	0.08-0.10	0.0-2.9	0.2-0.5	.43	.43			
190: Jeddito-----	0-5	5-10	1.45-1.55	6.00-20.00	0.08-0.10	0.0-2.9	0.2-0.4	.20	.20	5	2	134
	5-16	5-10	1.45-1.55	6.00-20.00	0.06-0.08	0.0-2.9	0.2-0.4	.17	.17			
	16-70	10-18	1.45-1.55	0.20-0.60	0.10-0.14	0.0-2.9	0.2-0.6	.24	.24			
195: Tewa-----	0-3	10-20	1.45-1.55	2.00-6.00	0.12-0.14	0.0-2.9	0.4-0.6	.28	.28	5	3	86
	3-27	18-25	1.45-1.55	0.60-2.00	0.13-0.15	0.0-2.9	0.3-0.5	.37	.37			
	27-66	18-25	1.45-1.55	0.60-2.00	0.10-0.12	0.0-2.9	0.2-0.4	.32	.32			

Table 15.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
200:												
Tocito-----	0-6	18-27	1.20-1.30	0.60-2.00	0.19-0.21	0.0-2.9	0.5-1.0	.43	.43	5	4L	86
	6-12	27-35	1.40-1.50	0.20-0.60	0.16-0.20	0.0-2.9	0.3-0.5	.32	.32			
	12-16	27-35	1.40-1.50	0.20-0.60	0.14-0.16	3.0-5.9	0.3-0.5	.37	.37			
	16-28	18-25	1.40-1.50	0.60-2.00	0.12-0.15	0.0-2.9	0.2-0.5	.43	.43			
	28-70	20-35	1.45-1.55	0.20-0.60	0.12-0.15	3.0-5.9	0.2-0.4	.43	.43			
205:												
Shiprock-----	0-3	5-10	1.50-1.60	6.00-20.00	0.09-0.10	0.0-2.9	0.4-0.6	.20	.20	5	2	134
	3-36	15-18	1.55-1.65	2.00-6.00	0.13-0.15	0.0-2.9	0.3-0.5	.28	.28			
	36-66	10-15	1.50-1.60	2.00-6.00	0.10-0.11	0.0-2.9	0.2-0.4	.28	.28			
Farb-----	0-2	0-5	1.40-1.50	6.00-20.00	0.04-0.07	0.0-2.9	0.2-0.5	.17	.17	1	1	250
	2-10	5-18	1.50-1.60	2.00-6.00	0.12-0.14	0.0-2.9	0.2-0.4	.28	.28			
	10-14	---	---	---	---	---	---	---	---			
210:												
Mack-----	0-2	15-20	1.45-1.55	2.00-6.00	0.13-0.15	0.0-2.9	0.5-0.8	.28	.28	5	3	86
	2-8	10-20	1.45-1.55	2.00-6.00	0.11-0.13	0.0-2.9	0.4-0.6	.24	.24			
	8-24	20-27	1.45-1.55	0.60-2.00	0.14-0.16	0.0-2.9	0.3-0.5	.32	.32			
	24-65	10-18	1.45-1.55	2.00-6.00	0.11-0.13	0.0-2.9	0.2-0.5	.24	.24			
Mesa-----	0-3	15-20	1.45-1.55	2.00-6.00	0.12-0.14	0.0-2.9	0.4-0.8	.28	.28	5	3	86
	3-32	20-30	1.50-1.60	0.60-2.00	0.11-0.13	0.0-2.9	0.4-0.6	.32	.32			
	32-57	10-20	1.45-1.55	2.00-6.00	0.06-0.07	0.0-2.9	0.3-0.5	.10	.24			
	57-64	10-20	1.45-1.55	2.00-6.00	0.06-0.07	0.0-2.9	0.2-0.4	.10	.24			
215:												
Persayo-----	0-2	15-20	1.50-1.60	0.60-2.00	0.15-0.17	0.0-2.9	0.2-0.6	.55	.55	1	3	86
	2-18	18-27	1.40-1.50	0.60-2.00	0.10-0.12	0.0-2.9	0.2-0.4	.37	.37			
	18-22	---	---	0.00-0.20	---	---	---	---	---			
Fordbutte-----	0-4	10-18	1.40-1.50	0.60-2.00	0.15-0.17	0.0-2.9	0.4-0.8	.55	.55	2	3	86
	4-26	18-30	1.45-1.55	0.60-2.00	0.16-0.18	0.0-2.9	0.2-0.4	.37	.37			
	26-34	18-30	1.45-1.55	0.60-2.00	0.11-0.13	0.0-2.9	0.2-0.4	.37	.37			
	34-44	---	---	---	---	---	---	---	---			

Table 15.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
220: Chinde-----	0-2	18-27	1.40-1.50	0.60-2.00	0.12-0.14	0.0-2.9	0.2-0.4	.37	.37	5	4L	86
	2-9	25-35	1.50-1.55	0.20-0.60	0.14-0.16	3.0-5.9	0.4-0.6	.32	.32			
	9-33	35-45	1.50-1.60	0.20-0.60	0.08-0.10	6.0-8.9	0.2-0.4	.24	.24			
	33-64	35-45	1.30-1.40	0.20-0.60	0.03-0.05	6.0-8.9	0.2-0.4	.24	.24			
230: Ravola-----	0-10	12-18	1.35-1.45	0.60-2.00	0.15-0.17	0.0-2.9	0.5-0.9	.55	.55	5	3	86
	10-70	18-25	1.40-1.50	0.60-2.00	0.15-0.18	0.0-2.9	0.3-0.5	.43	.43			
235: Wingrock-----	0-5	5-10	1.50-1.60	6.00-20.00	0.05-0.07	0.0-2.9	0.4-0.6	.10	.20	5	3	86
	5-12	10-18	1.45-1.55	2.00-6.00	0.10-0.12	0.0-2.9	0.3-0.5	.24	.24			
	12-36	5-15	1.50-1.60	6.00-20.00	0.05-0.10	0.0-2.9	0.2-0.4	.17	.20			
	36-70	10-18	1.45-1.55	2.00-6.00	0.07-0.09	0.0-2.9	0.2-0.4	.24	.24			
Rock outcrop-----	0-80	---	---	---	---	---	---	---	---	-	---	---
240: Nageezi-----	0-2	5-10	1.55-1.65	6.00-20.00	0.09-0.10	0.0-2.9	0.6-0.8	.20	.20	5	2	134
	2-12	10-15	1.45-1.55	2.00-6.00	0.12-0.14	0.0-2.9	0.4-0.7	.28	.28			
	12-42	10-18	1.50-1.60	2.00-6.00	0.13-0.16	0.0-2.9	0.5-1.0	.32	.32			
	42-64	5-10	1.55-1.65	6.00-20.00	0.04-0.06	0.0-2.9	0.1-0.3	.17	.17			
245: Tsebitai-----	0-5	10-18	1.40-1.50	0.60-2.00	0.15-0.17	0.0-2.9	0.4-0.6	.55	.55	5	3	86
	5-26	10-18	1.40-1.50	0.60-2.00	0.15-0.17	0.0-2.9	0.4-0.6	.43	.43			
	26-64	8-18	1.40-1.50	0.60-2.00	0.11-0.16	0.0-2.9	0.3-0.5	.43	.43			
250: Littlehat-----	0-2	18-27	1.20-1.30	0.60-2.00	0.08-0.13	0.0-2.9	0.3-0.5	.43	.43	2	4L	86
	2-31	18-35	1.30-1.50	0.60-2.00	0.04-0.10	3.0-5.9	0.2-0.4	.43	.43			
	31-41	---	---	---	---	---	---	---	---			

Table 15.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
250: Persayo-----	0-2	15-20	1.50-1.60	0.60-2.00	0.15-0.17	0.0-2.9	0.2-0.6	.55	.55	1	3	86
	2-6	18-27	1.40-1.50	0.60-2.00	0.10-0.12	0.0-2.9	0.2-0.4	.37	.37			
	6-17	27-35	1.50-1.60	0.20-0.60	0.10-0.12	3.0-5.9	0.2-0.4	.32	.32			
	17-21	---	---	0.00-0.20	---	---	---	---	---			
Nataani-----	0-3	10-18	1.40-1.50	0.60-2.00	0.15-0.17	0.0-2.9	0.4-0.8	.55	.55	2	3	86
	3-9	15-20	1.35-1.45	0.60-2.00	0.15-0.18	0.0-2.9	0.4-0.6	.49	.49			
	9-21	---	1.15-1.35	0.60-2.00	0.10-0.15	0.0-2.9	0.4-0.6	---	---			
	21-30	10-18	1.50-1.60	0.60-2.00	0.08-0.10	0.0-2.9	0.3-0.5	.49	.49			
	30-40	---	---	---	---	---	---	---	---			
255: Benally-----	0-3	15-18	1.50-1.60	2.00-6.00	0.12-0.14	0.0-2.9	0.3-0.5	.28	.28	5	3	86
	3-14	18-27	1.45-1.55	0.60-2.00	0.09-0.13	0.0-2.9	0.2-0.4	.28	.28			
	14-41	27-35	1.45-1.55	0.20-0.60	0.04-0.05	3.0-5.9	0.2-0.4	.32	.32			
	41-65	35-40	1.50-1.60	0.06-0.20	0.04-0.05	3.0-5.9	0.2-0.4	.37	.37			
260: Littlehat-----	0-2	18-27	1.20-1.30	0.60-2.00	0.08-0.13	0.0-2.9	0.3-0.5	.43	.43	2	4L	86
	2-36	18-35	1.30-1.50	0.60-2.00	0.04-0.10	3.0-5.9	0.2-0.4	.43	.43			
	36-40	---	---	---	---	---	---	---	---			
Persayo-----	0-2	15-20	1.50-1.60	0.60-2.00	0.19-0.21	0.0-2.9	0.2-0.6	.43	.43	1	4L	86
	2-6	18-27	1.40-1.50	0.60-2.00	0.10-0.12	0.0-2.9	0.2-0.4	.37	.37			
	6-18	27-35	1.50-1.60	0.20-0.60	0.10-0.12	3.0-5.9	0.2-0.4	.32	.32			
	18-22	---	---	0.00-0.20	---	---	---	---	---			
Badland-----	0-60	---	---	---	---	---	---	---	---	-	---	---
265: Camac-----	0-3	10-18	1.40-1.50	2.00-6.00	0.06-0.08	0.0-2.9	0.4-0.6	.10	.28	2	6	48
	3-16	15-27	1.40-1.50	0.60-2.00	0.09-0.13	0.0-2.9	0.3-0.5	.15	.32			
	16-34	18-35	1.45-1.55	0.20-0.60	0.12-0.16	3.0-5.9	0.2-0.4	.32	.32			
	34-38	---	---	---	---	---	---	---	---			

Table 15.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
265:												
Kimbeto-----	0-2	15-20	1.40-1.50	2.00-6.00	0.12-0.14	0.0-2.9	0.5-0.8	.28	.28	5	3	86
	2-10	20-27	1.45-1.55	0.60-2.00	0.08-0.10	0.0-2.9	0.5-0.8	.37	.37			
	10-54	18-27	1.45-1.55	0.60-2.00	0.06-0.08	0.0-2.9	0.3-0.6	.28	.32			
	54-66	20-27	1.45-1.55	0.60-2.00	0.05-0.07	0.0-2.9	0.2-0.4	.15	.32			
Badland-----	0-60	---	---	---	---	---	---	---	---	-	---	---
270:												
Fruitland-----	0-7	20-27	1.40-1.50	0.60-2.00	0.14-0.16	0.0-2.9	0.5-1.0	.32	.32	5	5	56
	7-42	10-18	1.45-1.55	2.00-6.00	0.13-0.15	0.0-2.9	0.3-0.6	.28	.28			
	42-65	20-27	1.40-1.50	0.60-2.00	0.14-0.16	0.0-2.9	0.2-0.4	.32	.32			
275:												
Razito-----	0-6	4-8	1.40-1.50	6.00-20.00	0.06-0.08	0.0-2.9	0.2-0.4	.17	.17	5	2	134
	6-70	4-8	1.40-1.50	6.00-20.00	0.06-0.08	0.0-2.9	0.2-0.4	.17	.17			
285:												
Water-----	---	---	---	---	---	---	---	---	---	-	---	---
Riverwash-----	0-6	0-1	---	6.00-20.00	0.01-0.02	0.0-2.9	0.0-0.1	.02	.10	-	---	---
	6-60	0-1	---	6.00-20.00	0.02-0.03	0.0-2.9	---	.05	.10			
290:												
Mesa-----	0-12	35-40	1.30-1.40	0.06-0.20	0.19-0.21	3.0-5.9	0.5-1.0	.32	.32	5	4L	86
	12-25	20-35	1.50-1.60	0.60-2.00	0.15-0.20	3.0-5.9	0.4-0.6	.32	.32			
	25-31	20-27	1.50-1.60	0.60-2.00	0.11-0.15	0.0-2.9	0.3-0.5	.20	.37			
	31-37	20-25	1.40-1.50	0.60-2.00	0.06-0.08	0.0-2.9	0.2-0.4	.10	.32			
	37-68	5-15	1.40-1.50	6.00-20.00	0.01-0.05	0.0-2.9	0.2-0.4	.05	.15			
295:												
Mesa-----	0-16	20-30	1.30-1.40	0.60-2.00	0.14-0.16	0.0-2.9	0.5-1.0	.32	.32	5	5	56
	16-29	20-35	1.50-1.60	0.60-2.00	0.15-0.20	3.0-5.9	0.4-0.6	.32	.32			
	29-35	20-27	1.50-1.60	0.60-2.00	0.11-0.15	0.0-2.9	0.3-0.5	.20	.37			
	35-49	20-25	1.40-1.50	0.60-2.00	0.06-0.08	0.0-2.9	0.2-0.4	.10	.32			
	49-80	5-15	1.40-1.50	6.00-20.00	0.01-0.05	0.0-2.9	0.2-0.4	.05	.15			

Table 15.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
300:												
Farview-----	0-2	5-10	1.45-1.55	6.00-20.00	0.05-0.07	0.0-2.9	0.5-1.0	.10	.17	1	3	86
	2-9	10-18	1.50-1.60	2.00-6.00	0.10-0.14	0.0-2.9	0.5-1.0	.20	.28			
	9-13	---	---	---	---	---	---	---	---			
Rock outcrop-----	0-80	---	---	---	---	---	---	---	---	-	---	---
301:												
Farview-----	0-2	5-10	1.45-1.55	6.00-20.00	0.05-0.07	0.0-2.9	0.5-1.0	.10	.17	1	3	86
	2-6	10-18	1.50-1.60	2.00-6.00	0.10-0.14	0.0-2.9	0.5-1.0	.20	.28			
	6-16	---	---	---	---	---	---	---	---			
Sanostee-----	0-2	5-10	1.55-1.65	6.00-20.00	0.08-0.09	0.0-2.9	0.4-0.6	.20	.20	2	2	134
	2-15	18-30	1.50-1.60	0.60-2.00	0.12-0.16	0.0-2.9	0.5-1.0	.28	.28			
	15-24	15-27	1.50-1.60	0.60-2.00	0.08-0.13	0.0-2.9	0.4-0.8	.32	.32			
	24-32	15-27	1.50-1.60	0.60-2.00	0.08-0.13	0.0-2.9	0.3-0.5	.32	.32			
	32-42	---	---	---	---	---	---	---	---			
Rock outcrop-----	0-80	---	---	---	---	---	---	---	---	-	---	---
302:												
Doakum-----	0-2	10-20	1.50-1.60	2.00-6.00	0.13-0.15	0.0-2.9	0.5-1.0	.28	.28	3	3	86
	2-16	20-27	1.45-1.55	0.60-2.00	0.14-0.16	0.0-2.9	0.6-0.8	.37	.37			
	16-53	18-25	1.50-1.60	0.60-2.00	0.10-0.13	0.0-2.9	0.3-0.6	.32	.32			
	53-63	---	---	---	---	---	---	---	---			
303:												
Snapill-----	0-3	10-18	1.45-1.55	0.60-2.00	0.15-0.17	0.0-2.9	0.5-0.9	.55	.55	3	3	86
	3-13	18-27	1.40-1.50	0.60-2.00	0.15-0.17	0.0-2.9	0.5-0.9	.37	.37			
	13-38	18-27	1.40-1.50	0.60-2.00	0.15-0.17	0.0-2.9	0.5-0.7	.37	.37			
	38-53	12-25	1.40-1.50	0.60-2.00	0.08-0.12	0.0-2.9	0.3-0.5	.37	.37			
	53-63	---	---	---	---	---	---	---	---			
304:												
Farview-----	0-2	5-10	1.45-1.55	6.00-20.00	0.05-0.07	0.0-2.9	0.5-1.0	.10	.17	1	3	86
	2-6	10-18	1.50-1.60	2.00-6.00	0.10-0.14	0.0-2.9	0.5-1.0	.20	.28			
	6-16	---	---	---	---	---	---	---	---			

Table 15.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
304:												
Beclabito-----	0-4	10-18	1.40-1.50	2.00-6.00	0.11-0.15	0.0-2.9	0.3-0.5	.20	.28	3	3	86
	4-14	18-30	1.55-1.65	0.60-2.00	0.10-0.14	0.0-2.9	0.3-0.5	.24	.32			
	14-36	18-27	1.55-1.65	0.20-0.60	0.08-0.11	0.0-2.9	0.2-0.5	.24	.32			
	36-45	10-27	1.50-1.60	0.20-0.60	0.05-0.08	0.0-2.9	0.2-0.5	.28	.32			
	45-56	27-35	1.50-1.60	0.20-0.60	0.08-0.10	3.0-5.9	0.2-0.5	.28	.32			
	56-66	---	---	---	---	---	---	---	---			
Rock outcrop-----	0-80	---	---	---	---	---	---	---	---	-	---	---
305:												
Strych-----	0-3	8-18	1.45-1.55	2.00-6.00	0.03-0.07	0.0-2.9	0.5-1.0	.10	.55	5	8	0
	3-15	8-18	1.55-1.65	2.00-6.00	0.07-0.11	0.0-2.9	0.5-1.0	.17	.55			
	15-47	8-18	1.55-1.65	2.00-6.00	0.06-0.10	0.0-2.9	0.3-0.5	.15	.43			
	47-64	5-18	1.50-1.60	2.00-6.00	0.05-0.09	0.0-2.9	0.3-0.5	.10	.43			
Eagleeye-----	0-2	30-40	1.20-1.30	0.20-0.60	0.11-0.13	3.0-5.9	0.3-0.5	.10	.37	1	6	48
	2-8	35-50	1.45-1.55	0.06-0.20	0.15-0.17	6.0-8.9	0.3-0.5	.37	.37			
	8-18	35-50	1.45-1.55	0.06-0.20	0.07-0.10	6.0-8.9	0.2-0.4	.37	.37			
	18-28	---	---	---	---	---	---	---	---			
Rock outcrop-----	0-80	---	---	---	---	---	---	---	---	-	---	---
306:												
Arches-----	0-3	4-8	1.45-1.55	6.00-20.00	0.09-0.10	0.0-2.9	0.5-1.0	.20	.20	1	2	134
	3-14	4-8	1.40-1.50	6.00-20.00	0.07-0.09	0.0-2.9	0.4-0.6	.20	.20			
	14-18	2-5	1.45-1.55	6.00-20.00	0.04-0.06	0.0-2.9	0.3-0.5	.15	.15			
	18-28	---	---	---	---	---	---	---	---			
Kitsili-----	0-7	10-18	1.45-1.55	2.00-6.00	0.13-0.15	0.0-2.9	0.5-1.0	.28	.28	5	3	86
	7-14	10-18	1.45-1.55	2.00-6.00	0.14-0.16	0.0-2.9	0.3-0.5	.37	.37			
	14-64	10-18	1.45-1.55	2.00-6.00	0.14-0.16	0.0-2.9	0.3-0.5	.37	.37			
Mido-----	0-3	4-8	1.50-1.60	6.00-20.00	0.08-0.10	0.0-2.9	0.4-0.6	.20	.20	5	2	134
	3-62	4-8	1.50-1.60	6.00-20.00	0.07-0.09	0.0-2.9	0.3-0.5	.20	.20			

Table 15.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
307:												
Bodot-----	0-3	27-35	1.20-1.30	0.20-0.60	0.05-0.07	3.0-5.9	0.5-1.0	.05	.32	2	8	0
	3-8	35-55	1.35-1.50	0.06-0.20	0.16-0.20	6.0-8.9	0.4-0.6	.32	.32			
	8-24	35-55	1.35-1.50	0.06-0.20	0.11-0.15	6.0-8.9	0.2-0.4	.32	.32			
	24-34	---	---	0.00-0.20	---	---	---	---	---			
Beclabito-----	0-4	15-20	1.35-1.45	0.60-2.00	0.04-0.06	0.0-2.9	0.4-0.6	.17	.55	3	6	48
	4-23	30-35	1.45-1.55	0.20-0.60	0.11-0.16	3.0-5.9	0.2-0.4	.15	.32			
	23-32	30-40	1.40-1.50	0.20-0.60	0.19-0.21	3.0-5.9	0.2-0.4	.32	.32			
	32-56	35-50	1.40-1.50	0.20-0.60	0.15-0.19	3.0-5.9	0.2-0.4	.24	.24			
	56-66	---	---	---	---	---	---	---	---			
Rock outcrop-----	0-80	---	---	---	---	---	---	---	---	-	---	---
308:												
Mcelmo-----	0-1	20-25	1.40-1.50	0.60-2.00	0.06-0.09	0.0-2.9	0.2-0.5	.10	.32	3	6	48
	1-14	40-60	1.40-1.50	0.06-0.20	0.12-0.15	6.0-8.9	0.2-0.5	.17	.20			
	14-30	35-50	1.40-1.50	0.06-0.20	0.07-0.10	6.0-8.9	0.2-0.5	.24	.32			
	30-54	---	1.40-1.50	0.20-0.60	0.07-0.10	6.0-8.9	0.2-0.5	---	---			
	54-64	---	---	---	---	---	---	---	---			
Farview-----	0-3	10-18	1.50-1.60	2.00-6.00	0.12-0.14	0.0-2.9	0.5-1.0	.28	.32	1	3	86
	3-7	10-18	1.50-1.60	2.00-6.00	0.10-0.14	0.0-2.9	0.5-1.0	.20	.28			
	7-11	---	---	---	---	---	---	---	---			
309:												
Rock outcrop-----	0-80	---	---	---	---	---	---	---	---	-	---	---
Rizno-----	0-4	8-18	1.45-1.55	2.00-6.00	0.13-0.15	0.0-2.9	0.5-0.8	.28	.28	1	3	86
	4-6	8-18	1.50-1.60	2.00-6.00	0.10-0.13	0.0-2.9	0.2-0.5	.15	.28			
	6-16	---	---	---	---	---	---	---	---			
310:												
Millett-----	0-2	8-18	1.35-1.45	2.00-6.00	0.10-0.12	0.0-2.9	0.8-2.0	.15	.28	5	5	56
	2-6	18-27	1.40-1.50	0.60-2.00	0.10-0.13	0.0-2.9	0.8-2.0	.15	.28			
	6-16	20-27	1.40-1.50	0.60-2.00	0.09-0.12	0.0-2.9	0.6-1.0	.15	.32			
	16-31	8-18	1.45-1.55	2.00-6.00	0.05-0.10	0.0-2.9	0.4-0.6	.10	.28			
	31-64	8-18	1.50-1.60	2.00-6.00	0.05-0.08	0.0-2.9	0.2-0.5	.10	.24			

Table 15.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
310:												
Blanding-----	0-2	12-16	1.35-1.45	2.00-6.00	0.14-0.16	0.0-2.9	0.4-0.6	.55	.55	5	3	86
	2-9	15-20	1.35-1.45	0.60-2.00	0.15-0.17	0.0-2.9	0.4-0.6	.43	.43			
	9-24	20-27	1.40-1.50	0.60-2.00	0.15-0.17	0.0-2.9	0.2-0.6	.43	.43			
	24-63	18-24	1.40-1.50	0.60-2.00	0.14-0.16	0.0-2.9	0.2-0.5	.37	.37			
Strych-----	0-1	8-18	1.45-1.55	2.00-6.00	0.05-0.10	0.0-2.9	0.5-1.0	.10	.28	5	6	48
	1-5	8-18	1.45-1.55	2.00-6.00	0.08-0.13	0.0-2.9	0.5-1.0	.15	.28			
	5-42	8-18	1.45-1.55	2.00-6.00	0.05-0.10	0.0-2.9	0.6-0.8	.10	.28			
	42-66	8-18	1.50-1.60	2.00-6.00	0.08-0.13	0.0-2.9	0.3-0.5	.15	.28			
311:												
Kinusta-----	0-3	10-18	1.50-1.60	0.60-2.00	0.11-0.14	0.0-2.9	0.4-0.6	.28	.55	1	5	56
	3-17	12-18	1.55-1.65	0.60-2.00	0.15-0.18	0.0-2.9	0.2-0.4	.43	.43			
	17-27	---	---	---	---	---	---	---	---			
Eslendo-----	0-3	10-18	1.50-1.60	2.00-6.00	0.05-0.10	0.0-2.9	0.5-1.0	.10	.28	1	6	48
	3-18	18-30	1.50-1.60	0.60-2.00	0.16-0.21	0.0-2.9	0.2-0.6	.32	.32			
	18-28	---	---	---	---	---	---	---	---			
Rock outcrop-----	0-80	---	---	---	---	---	---	---	---	-	---	---
312:												
Blanding-----	0-3	12-16	1.35-1.45	2.00-6.00	0.14-0.16	0.0-2.9	0.4-0.6	.55	.55	5	3	86
	3-9	15-20	1.35-1.45	0.60-2.00	0.15-0.17	0.0-2.9	0.4-0.6	.43	.43			
	9-37	20-27	1.40-1.50	0.60-2.00	0.15-0.17	0.0-2.9	0.2-0.6	.43	.43			
	37-66	18-24	1.40-1.50	0.60-2.00	0.14-0.16	0.0-2.9	0.2-0.5	.37	.37			
313:												
Marjane-----	0-2	5-15	1.45-1.55	2.00-6.00	0.13-0.15	0.0-2.9	0.5-1.0	.28	.28	2	3	86
	2-18	8-18	1.45-1.55	2.00-6.00	0.14-0.16	0.0-2.9	0.3-0.5	.37	.37			
	18-28	8-18	1.45-1.55	2.00-6.00	0.14-0.16	0.0-2.9	0.2-0.4	.37	.37			
	28-38	---	---	---	---	---	---	---	---			
Kitsili-----	0-10	5-10	1.40-1.50	6.00-20.00	0.09-0.10	0.0-2.9	0.5-1.0	.20	.20	5	2	134
	10-19	10-18	1.45-1.55	2.00-6.00	0.14-0.16	0.0-2.9	0.3-0.5	.37	.37			
	19-65	10-18	1.45-1.55	2.00-6.00	0.14-0.16	0.0-2.9	0.3-0.5	.37	.37			

Table 15.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
314: Mido-----	0-7	4-8	1.50-1.60	6.00-20.00	0.08-0.10	0.0-2.9	0.4-0.6	.20	.20	5	2	134
	7-62	4-8	1.50-1.60	6.00-20.00	0.07-0.09	0.0-2.9	0.3-0.5	.20	.20			
315: Shoegame-----	0-4	8-12	1.50-1.60	2.00-6.00	0.05-0.08	0.0-2.9	0.3-0.5	.10	.24	5	6	48
	4-19	5-8	1.50-1.65	2.00-6.00	0.03-0.05	0.0-2.9	0.3-0.5	.05	.17			
	19-65	0-5	1.50-1.65	20.00-20.00	0.03-0.05	0.0-2.9	0.3-0.5	.02	.10			
Riverwash-----	0-10	0-3	---	20.00-20.00	0.01-0.02	0.0-2.9	0.0-0.1	.02	.10	-	---	---
	10-80	0-1	---	20.00-20.00	0.01-0.02	0.0-2.9	0.0-0.1	.10	.10			
316: Millett-----	0-2	8-18	1.35-1.45	2.00-6.00	0.05-0.10	0.0-2.9	1.0-2.0	.10	.28	5	6	48
	2-14	20-27	1.45-1.55	0.60-2.00	0.09-0.14	0.0-2.9	0.8-1.0	.15	.32			
	14-26	10-20	1.45-1.55	2.00-6.00	0.05-0.10	0.0-2.9	0.4-0.6	.10	.28			
	26-63	8-18	1.50-1.60	2.00-6.00	0.05-0.10	0.0-2.9	0.2-0.5	.10	.28			
Strych-----	0-2	8-18	1.45-1.55	2.00-6.00	0.03-0.06	0.0-2.9	0.7-1.0	.05	.28	-	8	0
	2-16	8-18	1.50-1.60	2.00-6.00	0.06-0.10	0.0-2.9	0.4-0.8	.10	.28			
	16-53	8-18	1.55-1.65	2.00-6.00	0.06-0.10	0.0-2.9	0.3-0.5	.10	.28			
	53-64	5-18	1.50-1.60	2.00-6.00	0.05-0.09	0.0-2.9	0.3-0.5	.10	.24			
Doakum-----	0-3	8-18	1.45-1.55	2.00-6.00	0.13-0.15	0.0-2.9	0.5-1.0	.28	.28	5	3	86
	3-16	18-25	1.45-1.55	0.60-2.00	0.14-0.16	0.0-2.9	0.4-0.8	.32	.32			
	16-46	18-25	1.50-1.60	0.60-2.00	0.14-0.16	0.0-2.9	0.4-0.6	.32	.32			
	46-80	8-20	1.50-1.60	2.00-6.00	0.13-0.15	0.0-2.9	0.3-0.5	.28	.28			
317: Toadlena-----	0-1	18-27	1.45-1.55	0.60-2.00	0.13-0.15	0.0-2.9	0.7-1.0	.20	.37	1	5	56
	1-12	---	1.20-1.30	0.20-2.00	0.14-0.18	0.0-2.9	0.4-0.6	---	---			
	12-18	27-35	1.45-1.55	0.20-0.60	0.09-0.11	3.0-5.9	0.3-0.5	.37	.37			
	18-22	---	---	---	---	---	---	---	---			
Eagleeye-----	0-2	30-40	1.20-1.30	0.20-0.60	0.11-0.13	3.0-5.9	0.3-0.5	.10	.37	1	6	48
	2-16	35-50	1.45-1.55	0.06-0.20	0.07-0.10	6.0-8.9	0.2-0.4	.37	.37			
	16-20	---	---	---	---	---	---	---	---			

Table 15.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
318: Camino-----	0-3	35-40	1.20-1.30	0.06-0.20	0.19-0.21	3.0-5.9	0.5-1.0	.37	.37	5	4	86
	3-28	35-50	1.40-1.50	0.06-0.20	0.15-0.21	3.0-5.9	0.5-1.0	.32	.32			
	28-52	35-50	1.45-1.55	0.06-0.20	0.15-0.21	3.0-5.9	0.4-0.6	.32	.32			
	52-68	30-40	1.45-1.55	0.06-0.20	0.19-0.21	3.0-5.9	0.3-0.5	.37	.37			
319: Skyhawk-----	0-2	16-20	1.45-1.55	2.00-6.00	0.02-0.05	0.0-2.9	1.0-2.0	.05	.24	2	8	0
	2-6	20-35	1.30-1.40	0.20-0.60	0.12-0.18	3.0-5.9	1.0-2.0	.17	.32			
	6-23	27-35	1.40-1.50	0.20-0.60	0.19-0.21	3.0-5.9	1.0-2.0	.37	.37			
	23-35	27-35	1.45-1.55	0.20-0.60	0.19-0.21	3.0-5.9	0.5-1.0	.37	.37			
	35-45	---	---	---	---	---	---	---	---			
Lavellga-----	0-2	8-18	1.40-1.50	2.00-6.00	0.05-0.10	0.0-2.9	1.0-2.0	.10	.28	5	6	48
	2-13	18-24	1.40-1.50	0.60-2.00	0.06-0.10	0.0-2.9	1.0-2.0	.10	.28			
	13-50	12-18	1.55-1.65	2.00-6.00	0.02-0.05	0.0-2.9	0.5-1.0	.10	.28			
	50-65	12-18	1.60-1.70	2.00-6.00	0.04-0.08	0.0-2.9	0.4-0.6	.10	.28			
320: Beclabito-----	0-7	8-14	1.40-1.50	2.00-6.00	0.14-0.16	0.0-2.9	0.5-1.0	.55	.55	2	3	86
	7-24	10-18	1.45-1.55	0.60-2.00	0.15-0.20	0.0-2.9	0.3-0.5	.43	.43			
	24-31	10-18	1.45-1.55	0.60-2.00	0.10-0.12	0.0-2.9	0.2-0.4	.43	.43			
	31-37	8-14	1.50-1.60	2.00-6.00	0.07-0.09	0.0-2.9	0.2-0.4	.43	.43			
	37-47	---	---	---	---	---	---	---	---			
Kinusta-----	0-3	10-18	1.50-1.60	0.60-2.00	0.06-0.12	0.0-2.9	0.4-0.6	.10	.37	1	6	48
	3-16	12-18	1.55-1.65	0.60-2.00	0.15-0.18	0.0-2.9	0.2-0.4	.43	.43			
	16-20	---	---	---	---	---	---	---	---			
Badland-----	0-60	---	---	---	---	---	---	---	---	-	---	---
400: Wetherill-----	0-3	15-18	1.35-1.45	0.60-2.00	0.15-0.17	0.0-2.9	1.0-2.0	.55	.55	5	3	86
	3-18	20-30	1.35-1.45	0.60-2.00	0.17-0.20	0.0-2.9	0.5-1.0	.32	.32			
	18-42	20-30	1.40-1.50	0.60-2.00	0.16-0.20	0.0-2.9	0.3-0.5	.32	.32			
	42-70	18-25	1.40-1.50	0.60-2.00	0.15-0.17	0.0-2.9	0.3-0.5	.32	.32			

Table 15.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
400: Atlatl-----	0-2	15-18	1.35-1.45	2.00-6.00	0.10-0.13	0.0-2.9	1.0-2.0	.15	.28	2	5	56
	2-17	15-20	1.40-1.50	2.00-6.00	0.12-0.17	0.0-2.9	0.5-2.0	.32	.32			
	17-30	10-18	1.50-1.60	0.60-2.00	0.12-0.17	0.0-2.9	0.4-0.6	.32	.32			
	30-40	---	---	---	---	---	---	---	---			
401: Vessilla-----	0-3	10-16	1.40-1.50	2.00-6.00	0.10-0.12	0.0-2.9	0.5-1.0	.15	.28	1	5	56
	3-8	12-18	1.40-1.50	2.00-6.00	0.11-0.13	0.0-2.9	0.5-1.0	.20	.28			
	8-18	---	---	---	---	---	---	---	---			
Rock outcrop-----	0-80	---	---	---	---	---	---	---	---	-	---	---
402: Chazner-----	0-2	15-18	1.10-1.20	2.00-6.00	0.06-0.10	0.0-2.9	2.0-4.0	.17	.55	2	6	48
	2-6	15-20	1.25-1.35	2.00-6.00	0.10-0.13	0.0-2.9	1.0-3.0	.20	.43			
	6-18	20-35	1.45-1.55	0.60-2.00	0.10-0.13	3.0-5.9	0.5-1.0	.15	.32			
	18-29	8-18	1.55-1.65	2.00-6.00	0.04-0.07	0.0-2.9	0.5-1.0	.05	.24			
	29-39	---	---	---	---	---	---	---	---			
403: Chazner-----	0-2	15-18	1.10-1.20	2.00-6.00	0.06-0.09	0.0-2.9	2.0-4.0	.10	.28	2	6	48
	2-6	15-20	1.25-1.35	2.00-6.00	0.10-0.13	0.0-2.9	1.0-3.0	.20	.43			
	6-16	20-35	1.45-1.55	0.60-2.00	0.10-0.13	3.0-5.9	0.5-1.0	.15	.32			
	16-25	8-18	1.55-1.65	2.00-6.00	0.04-0.07	0.0-2.9	0.5-1.0	.05	.24			
	25-29	---	---	---	---	---	---	---	---			
Katzine-----	0-7	8-18	1.30-1.40	2.00-6.00	0.06-0.10	0.0-2.9	1.0-3.0	.17	.55	5	6	48
	7-47	8-18	1.45-1.55	2.00-6.00	0.05-0.08	0.0-2.9	0.5-1.0	.10	.28			
	47-63	3-8	1.40-1.50	6.00-20.00	0.01-0.02	0.0-2.9	0.4-0.6	.02	.15			
404: Wetherill-----	0-4	15-18	1.35-1.45	0.60-2.00	0.15-0.17	0.0-2.9	1.0-2.0	.55	.55	5	3	86
	4-19	20-30	1.35-1.45	0.60-2.00	0.17-0.20	0.0-2.9	0.5-1.0	.32	.32			
	19-65	20-30	1.40-1.50	0.60-2.00	0.16-0.20	0.0-2.9	0.3-0.5	.32	.32			

Table 15.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
404: Tsezhin-----	0-2	10-20	1.10-1.20	0.60-2.00	0.06-0.10	0.0-2.9	1.0-3.0	.17	.55	5	6	48
	2-35	27-35	1.45-1.55	0.20-0.60	0.07-0.12	3.0-5.9	0.5-1.0	.10	.32			
	35-51	20-35	1.45-1.55	0.20-0.60	0.07-0.12	3.0-5.9	0.3-0.5	.10	.32			
	51-65	20-35	1.45-1.55	0.20-0.60	0.07-0.12	3.0-5.9	0.3-0.5	.10	.32			
406: Rock outcrop-----	0-80	---	---	---	---	---	---	---	---	-	---	---
Nizhoni-----	0-3	10-18	1.45-1.55	2.00-6.00	0.15-0.17	0.0-2.9	0.5-1.0	.55	.55	1	3	86
	3-7	10-18	1.45-1.55	2.00-6.00	0.14-0.16	0.0-2.9	0.5-1.0	.43	.43			
	7-17	---	---	---	---	---	---	---	---			
407: Iwela-----	0-3	8-18	1.35-1.45	2.00-6.00	0.07-0.09	0.0-2.9	1.0-2.0	.10	.28	5	6	48
	3-26	18-35	1.45-1.55	0.60-2.00	0.10-0.13	3.0-5.9	0.5-1.0	.15	.32			
	26-44	8-18	1.45-1.55	2.00-6.00	0.05-0.07	0.0-2.9	0.3-0.5	.10	.24			
	44-64	5-10	1.60-1.70	6.00-20.00	0.03-0.05	0.0-2.9	0.3-0.5	.05	.17			
Nomrah-----	0-3	8-18	1.35-1.45	2.00-6.00	0.13-0.15	0.0-2.9	1.0-2.0	.28	.28	5	3	86
	3-32	20-35	1.40-1.50	0.60-2.00	0.13-0.16	3.0-5.9	0.5-1.0	.32	.32			
	32-58	15-27	1.40-1.50	0.60-6.00	0.12-0.16	0.0-2.9	0.4-0.6	.32	.32			
	58-62	8-18	1.50-1.60	2.00-6.00	0.12-0.15	0.0-2.9	0.2-0.5	.28	.28			
Vosburg-----	0-7	16-27	1.10-1.20	0.60-2.00	0.16-0.18	0.0-2.9	2.0-3.0	.37	.37	5	6	48
	7-36	20-35	1.30-1.40	0.60-2.00	0.15-0.20	3.0-5.9	1.0-3.0	.32	.32			
	36-65	20-35	1.40-1.50	0.60-2.00	0.15-0.20	3.0-5.9	0.6-1.0	.32	.32			
408: Nizhoni-----	0-3	10-18	1.45-1.55	2.00-6.00	0.15-0.17	0.0-2.9	0.5-1.0	.55	.55	1	3	86
	3-9	10-18	1.45-1.55	2.00-6.00	0.14-0.16	0.0-2.9	0.5-1.0	.43	.43			
	9-13	---	---	---	---	---	---	---	---			
Rock outcrop-----	0-80	---	---	---	---	---	---	---	---	-	---	---

Table 15.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
409: Chinlini-----	0-3	15-18	1.15-1.20	2.00-6.00	0.16-0.18	0.0-2.9	1.0-2.0	.37	.37	3	5	56
	3-26	18-27	1.35-1.45	0.60-2.00	0.14-0.18	0.0-2.9	0.6-1.0	.37	.37			
	26-38	18-27	1.50-1.60	0.60-2.00	0.14-0.18	0.0-2.9	0.4-0.6	.32	.32			
	38-50	10-18	1.60-1.70	2.00-6.00	0.04-0.06	0.0-2.9	0.3-0.5	.05	.20			
	50-60	---	---	---	---	---	---	---	---			
410: Wetherill-----	0-3	8-18	1.35-1.45	2.00-6.00	0.15-0.17	0.0-2.9	1.0-2.0	.55	.55	5	3	86
	3-45	18-30	1.35-1.45	0.60-2.00	0.14-0.17	0.0-2.9	0.4-0.8	.32	.32			
	45-66	8-18	1.50-1.60	2.00-6.00	0.13-0.15	0.0-2.9	0.3-0.5	.28	.28			
411: Sojourn-----	0-2	10-18	1.20-1.30	0.60-2.00	0.13-0.15	0.0-2.9	0.4-0.6	.20	.37	1	4L	86
	2-15	12-18	1.45-1.55	0.60-2.00	0.16-0.21	0.0-2.9	0.2-0.5	.43	.43			
	15-25	---	---	---	---	---	---	---	---			
Badland-----	0-60	---	---	---	---	---	---	---	---	-	---	---
412: Highdye-----	0-4	10-18	1.40-1.50	2.00-6.00	0.09-0.13	0.0-2.9	1.0-2.0	.15	.28	1	5	56
	4-13	35-50	1.35-1.45	0.06-0.20	0.15-0.20	3.0-5.9	0.5-1.0	.28	.28			
	13-23	---	---	---	---	---	---	---	---			
Menefee-----	0-2	18-27	1.15-1.25	0.60-2.00	0.14-0.16	0.0-2.9	0.5-1.0	.20	.37	1	5	56
	2-17	20-35	1.40-1.50	0.20-0.60	0.16-0.18	3.0-5.9	0.2-0.6	.37	.37			
	17-27	---	---	---	---	---	---	---	---			
413: Hozho-----	0-3	8-16	1.40-1.50	6.00-20.00	0.08-0.10	0.0-2.9	0.4-0.6	.15	.24	1	5	56
	3-6	8-14	1.40-1.50	6.00-20.00	0.07-0.11	0.0-2.9	0.4-0.6	.20	.20			
	6-14	2-8	1.55-1.65	6.00-20.00	0.06-0.09	0.0-2.9	0.2-0.4	.17	.17			
	14-24	---	---	---	---	---	---	---	---			

Table 15.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
413:												
Quezcan-----	0-3	30-40	1.25-1.35	0.20-0.60	0.08-0.13	3.0-5.9	0.5-1.0	.10	.32	2	6	48
	3-6	35-50	1.35-1.45	0.06-0.20	0.14-0.19	6.0-8.9	0.5-1.0	.24	.32			
	6-10	35-50	1.35-1.45	0.00-0.14	0.15-0.19	6.0-8.9	0.5-1.0	.28	.32			
	10-27	35-50	1.40-1.50	0.06-0.20	0.15-0.19	6.0-8.9	0.2-0.5	.32	.32			
	27-37	---	---	---	---	---	---	---	---			
Rock outcrop-----	0-80	---	---	---	---	---	---	---	---	-	---	---
414:												
Arabrab-----	0-3	10-18	1.50-1.60	2.00-6.00	0.06-0.11	0.0-2.9	1.0-2.0	.17	.55	1	8	0
	3-16	20-27	1.45-1.55	0.60-2.00	0.09-0.14	0.0-2.9	0.5-1.0	.15	.32			
	16-20	---	---	---	---	---	---	---	---			
Wetherill-----	0-3	10-18	1.45-1.55	2.00-6.00	0.15-0.17	0.0-2.9	1.0-2.0	.55	.55	3	3	86
	3-23	20-30	1.35-1.45	0.60-2.00	0.16-0.19	0.0-2.9	0.5-1.0	.32	.32			
	23-41	20-30	1.40-1.50	0.60-2.00	0.16-0.19	0.0-2.9	0.5-1.0	.32	.32			
	41-52	20-30	1.40-1.50	0.60-2.00	0.11-0.16	0.0-2.9	0.5-1.0	.15	.32			
	52-62	---	---	---	---	---	---	---	---			
415:												
Tsezhin-----	0-4	10-18	1.40-1.50	2.00-6.00	0.03-0.07	0.0-2.9	1.0-2.0	.10	.55	5	8	0
	4-25	20-35	1.40-1.50	0.60-2.00	0.06-0.12	3.0-5.9	0.5-1.0	.10	.32			
	25-62	20-35	1.45-1.55	0.60-2.00	0.06-0.12	3.0-5.9	0.0-0.5	.10	.32			
416:												
Arabrab-----	0-2	10-18	1.50-1.60	2.00-6.00	0.03-0.07	0.0-2.9	1.0-2.0	.10	.55	1	8	0
	2-15	20-27	1.45-1.55	0.60-2.00	0.09-0.14	0.0-2.9	0.5-1.0	.15	.32			
	15-25	---	---	---	---	---	---	---	---			
Rock outcrop-----	0-80	---	---	---	---	---	---	---	---	-	---	---
417:												
Wetherill-----	0-3	15-18	1.35-1.45	0.60-2.00	0.15-0.17	0.0-2.9	1.0-2.0	.55	.55	5	3	86
	3-25	20-30	1.35-1.45	0.60-2.00	0.17-0.20	0.0-2.9	0.5-1.0	.32	.32			
	25-61	20-30	1.40-1.50	0.60-2.00	0.16-0.20	0.0-2.9	0.3-0.5	.32	.32			
	61-66	18-25	1.40-1.50	0.60-2.00	0.15-0.17	0.0-2.9	0.3-0.5	.32	.32			

Table 15.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
418: Menefee-----	0-2	27-35	1.20-1.30	0.20-0.60	0.08-0.14	3.0-5.9	0.5-1.0	.10	.32	1	6	48
	2-18	27-35	1.55-1.65	0.20-0.60	0.18-0.20	3.0-5.9	0.4-0.6	.37	.37			
	18-28	---	---	---	---	---	---	---	---			
Espiritu-----	0-6	8-18	1.30-1.40	2.00-6.00	0.02-0.05	0.0-2.9	1.0-2.0	.05	.24	5	8	0
	6-24	18-27	1.20-1.30	0.60-2.00	0.05-0.10	0.0-2.9	0.5-1.0	.10	.24			
	24-42	20-35	1.40-1.50	0.60-2.00	0.06-0.13	3.0-5.9	0.4-0.6	.10	.32			
	42-70	8-18	1.55-1.65	0.60-2.00	0.10-0.14	0.0-2.9	0.3-0.5	.20	.37			
Rock outcrop-----	0-80	---	---	---	---	---	---	---	---	-	---	---
500: Whit-----	0-10	10-18	1.35-1.50	2.00-6.00	0.15-0.17	0.0-2.9	0.4-0.8	.55	.55	5	3	86
	10-38	18-25	1.45-1.55	0.60-2.00	0.15-0.18	0.0-2.9	0.3-0.6	.37	.37			
	38-65	15-25	1.50-1.60	0.60-2.00	0.13-0.18	0.0-2.9	0.2-0.5	.37	.37			
501: Escavada-----	0-5	2-8	1.40-1.50	6.00-20.00	0.08-0.10	0.0-2.9	0.2-0.6	.20	.20	5	2	134
	5-70	2-10	1.50-1.55	0.60-2.00	0.06-0.08	0.0-2.9	0.2-0.6	.17	.17			
Riverwash-----	0-6	0-1	---	6.00-20.00	0.03-0.04	0.0-2.9	0.0-0.1	.10	.10	-	---	---
	6-60	0-5	---	6.00-20.00	0.04-0.06	0.0-2.9	---	.10	.10			
502: Sogzie-----	0-10	5-8	1.55-1.65	6.00-20.00	0.08-0.10	0.0-2.9	0.2-0.6	.20	.20	5	2	134
	10-50	8-18	1.50-1.60	2.00-6.00	0.13-0.17	0.0-2.9	0.2-0.6	.43	.43			
	50-70	6-16	1.50-1.60	2.00-6.00	0.13-0.17	0.0-2.9	0.2-0.5	.43	.43			
503: Claysprings-----	0-2	20-30	1.40-1.50	0.60-2.00	0.03-0.06	3.0-5.9	0.4-0.6	.05	.32	1	8	0
	2-4	40-55	1.45-1.55	0.06-0.20	0.13-0.15	6.0-8.9	0.2-0.5	.20	.20			
	4-12	40-55	1.40-1.50	0.00-0.06	0.11-0.13	6.0-8.9	0.2-0.5	.20	.20			
	12-16	---	---	---	---	---	---	---	---			
Badland-----	0-60	---	---	---	---	---	---	---	---	-	---	---

Table 15.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
504:												
Tohona-----	0-1	20-30	1.40-1.50	0.60-2.00	0.07-0.10	0.0-2.9	0.4-0.6	.10	.32	2	6	48
	1-11	40-60	1.35-1.55	0.06-0.20	0.12-0.14	6.0-8.9	0.4-0.6	.20	.20			
	11-33	---	1.45-1.55	0.06-0.20	0.08-0.10	6.0-8.9	0.2-0.5	---	---			
	33-43	---	---	---	---	---	---	---	---			
Kimnoli-----	0-4	4-8	1.40-1.50	6.00-20.00	0.09-0.10	0.0-2.9	0.3-0.6	.20	.20	1	2	134
	4-9	18-25	1.20-1.30	0.60-2.00	0.12-0.14	3.0-5.9	0.2-0.5	.28	.28			
	9-19	---	---	---	---	---	---	---	---			
Claysprings-----	0-2	20-30	1.40-1.50	0.60-2.00	0.03-0.06	3.0-5.9	0.4-0.6	.05	.32	1	8	0
	2-5	40-55	1.45-1.55	0.06-0.20	0.13-0.15	6.0-8.9	0.2-0.5	.20	.20			
	5-16	40-55	1.40-1.50	0.00-0.06	0.11-0.13	6.0-8.9	0.2-0.5	.20	.20			
	16-26	---	---	---	---	---	---	---	---			
505:												
Recapture-----	0-3	5-10	1.40-1.50	6.00-20.00	0.08-0.10	0.0-2.9	0.2-0.5	.20	.20	5	2	134
	3-17	15-27	1.50-1.60	0.60-2.00	0.12-0.15	0.0-2.9	0.2-0.5	.32	.32			
	17-39	20-35	1.50-1.60	0.20-0.60	0.07-0.10	3.0-5.9	0.2-0.5	.32	.32			
	39-53	8-18	1.50-1.60	2.00-6.00	0.09-0.11	0.0-2.9	0.2-0.5	.28	.28			
	53-65	5-8	1.50-1.60	6.00-20.00	0.06-0.08	0.0-2.9	0.2-0.5	.20	.20			
Shorthair-----	0-1	5-10	1.55-1.65	6.00-20.00	0.07-0.08	0.0-2.9	0.2-0.5	.10	.20	1	3	86
	1-5	15-25	1.50-1.60	0.60-2.00	0.13-0.15	0.0-2.9	0.2-0.5	.32	.32			
	5-16	5-18	1.45-1.55	2.00-6.00	0.07-0.10	0.0-2.9	0.2-0.5	.24	.24			
	16-26	---	---	---	---	---	---	---	---			
Aneth-----	0-8	4-8	1.50-1.60	6.00-20.00	0.08-0.10	0.0-2.9	0.4-0.6	.20	.20	5	2	134
	8-28	5-10	1.50-1.60	6.00-20.00	0.08-0.10	0.0-2.9	0.2-0.5	.20	.20			
	28-37	10-16	1.45-1.55	2.00-6.00	0.13-0.15	0.0-2.9	0.2-0.5	.32	.32			
	37-65	6-16	1.50-1.60	2.00-6.00	0.08-0.13	0.0-2.9	0.2-0.5	.24	.24			

Table 15.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
506: Blackston-----	0-9	8-18	1.45-1.55	2.00-6.00	0.12-0.14	0.0-2.9	0.4-0.6	.28	.28	5	3	86
	9-25	18-25	1.45-1.55	0.60-2.00	0.13-0.15	0.0-2.9	0.2-0.5	.28	.28			
	25-49	2-8	1.45-1.55	6.00-20.00	0.02-0.03	0.0-2.9	0.2-0.5	.02	.17			
	49-66	2-8	1.45-1.55	6.00-20.00	0.05-0.07	0.0-2.9	0.2-0.5	.17	.17			
Grazane-----	0-2	10-18	1.20-1.30	2.00-6.00	0.06-0.09	0.0-2.9	0.2-0.6	.10	.28	2	6	48
	2-6	10-18	1.20-1.30	2.00-6.00	0.09-0.12	0.0-2.9	0.2-0.6	.15	.28			
	6-20	27-35	1.45-1.55	0.20-0.60	0.16-0.19	3.0-5.9	0.2-0.5	.32	.32			
	20-26	27-35	1.45-1.55	0.20-0.60	0.13-0.15	3.0-5.9	0.2-0.5	.32	.32			
	26-36	---	---	---	---	---	---	---	---			
507: Sheppard-----	0-3	4-8	1.45-1.55	6.00-20.00	0.08-0.10	0.0-2.9	0.2-0.6	.20	.20	5	2	134
	3-70	4-8	1.45-1.55	6.00-20.00	0.06-0.09	0.0-2.9	0.2-0.5	.20	.20			
508: Shalet-----	0-3	20-30	1.40-1.50	0.60-2.00	0.14-0.16	0.0-2.9	0.2-0.6	.32	.32	1	5	56
	3-6	20-35	1.40-1.50	0.20-0.60	0.12-0.14	3.0-5.9	0.2-0.5	.32	.32			
	6-15	20-35	1.45-1.55	0.20-0.60	0.08-0.10	3.0-5.9	0.2-0.5	.32	.32			
	15-25	---	---	---	---	---	---	---	---			
Rock outcrop-----	0-80	---	---	---	---	---	---	---	---	-	---	---
509: Trail-----	0-5	4-8	1.50-1.60	6.00-20.00	0.08-0.10	0.0-2.9	0.2-0.6	.20	.20	5	2	134
	5-70	4-8	1.40-1.50	2.00-6.00	0.06-0.09	0.0-2.9	0.2-0.6	.20	.20			
510: Aneth-----	0-2	4-8	1.50-1.60	6.00-20.00	0.08-0.10	0.0-2.9	0.4-0.6	.20	.20	5	2	134
	2-36	5-10	1.50-1.60	6.00-20.00	0.08-0.10	0.0-2.9	0.2-0.5	.20	.20			
	36-65	10-16	1.45-1.55	2.00-6.00	0.13-0.15	0.0-2.9	0.2-0.5	.32	.32			
511: Redlands-----	0-2	5-8	1.50-1.60	6.00-20.00	0.08-0.10	0.0-2.9	0.4-0.6	.20	.20	5	2	134
	2-13	8-18	1.50-1.60	2.00-6.00	0.13-0.15	0.0-2.9	0.3-0.5	.28	.28			
	13-22	18-25	1.40-1.50	0.60-2.00	0.14-0.16	0.0-2.9	0.3-0.5	.28	.28			
	22-65	20-30	1.45-1.55	0.60-2.00	0.15-0.18	0.0-2.9	0.3-0.5	.32	.32			

Table 15.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
512: Gotho-----	0-2	12-18	1.40-1.50	2.00-6.00	0.13-0.15	0.0-2.9	0.3-0.6	.28	.28	5	3	86
	2-13	20-35	1.40-1.50	0.20-0.60	0.15-0.20	3.0-5.9	0.2-0.5	.32	.32			
	13-66	18-35	1.45-1.55	0.20-0.60	0.11-0.15	3.0-5.9	0.2-0.5	.32	.32			
513: Sogzie-----	0-4	5-8	1.50-1.60	6.00-20.00	0.08-0.10	0.0-2.9	0.4-0.6	.20	.20	3	2	134
	4-14	5-8	1.50-1.60	6.00-20.00	0.09-0.10	0.0-2.9	0.4-0.6	.20	.20			
	14-36	10-18	1.45-1.55	2.00-6.00	0.13-0.15	0.0-2.9	0.2-0.5	.28	.28			
	36-42	5-10	1.50-1.60	6.00-20.00	0.08-0.10	0.0-2.9	0.2-0.5	.20	.20			
	42-52	---	---	---	---	---	---	---	---			
Aneth-----	0-7	4-8	1.50-1.60	6.00-20.00	0.08-0.10	0.0-2.9	0.4-0.6	.20	.20	5	2	134
	7-25	5-10	1.50-1.60	6.00-20.00	0.08-0.10	0.0-2.9	0.2-0.5	.20	.20			
	25-54	10-16	1.45-1.55	2.00-6.00	0.13-0.15	0.0-2.9	0.2-0.5	.32	.32			
	54-66	6-16	1.50-1.60	2.00-6.00	0.08-0.13	0.0-2.9	0.2-0.5	.24	.24			
514: Aneth-----	0-9	4-8	1.50-1.60	6.00-20.00	0.08-0.10	0.0-2.9	0.4-0.6	.20	.20	5	2	134
	9-33	5-10	1.50-1.60	6.00-20.00	0.08-0.10	0.0-2.9	0.2-0.5	.20	.20			
	33-51	10-16	1.45-1.55	2.00-6.00	0.13-0.15	0.0-2.9	0.2-0.5	.32	.32			
	51-70	6-16	1.50-1.60	2.00-6.00	0.08-0.13	0.0-2.9	0.2-0.5	.24	.24			
515: Piute-----	0-3	4-8	1.50-1.60	6.00-20.00	0.06-0.08	0.0-2.9	0.4-0.6	.10	.20	1	3	86
	3-7	2-8	1.50-1.60	6.00-20.00	0.06-0.09	0.0-2.9	0.2-0.4	.17	.17			
	7-17	---	---	---	---	---	---	---	---			
Bluechief-----	0-5	4-8	1.55-1.65	6.00-20.00	0.08-0.10	0.0-2.9	0.4-0.6	.20	.20	2	2	134
	5-11	8-12	1.45-1.55	2.00-6.00	0.14-0.16	0.0-2.9	0.2-0.5	.43	.43			
	11-22	10-16	1.50-1.60	2.00-6.00	0.12-0.14	0.0-2.9	0.2-0.5	.28	.28			
	22-29	10-16	1.50-1.60	2.00-6.00	0.13-0.15	0.0-2.9	0.2-0.5	.43	.43			
	29-39	---	---	---	---	---	---	---	---			
Rock outcrop-----	0-80	---	---	---	---	---	---	---	---	-	---	---

Table 15.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
516: Kaito-----	0-3	10-18	1.35-1.45	2.00-6.00	0.04-0.06	0.0-2.9	0.6-0.8	.05	.28	3	8	0
	3-10	14-18	1.40-1.50	2.00-6.00	0.11-0.14	0.0-2.9	0.4-0.6	.20	.43			
	10-24	14-20	1.40-1.50	2.00-6.00	0.14-0.17	0.0-2.9	0.0-0.5	.37	.43			
	24-47	8-16	1.40-1.50	2.00-6.00	0.13-0.15	0.0-2.9	0.0-0.5	.28	.28			
	47-57	---	---	---	---	---	---	---	---			
Claysprings-----	0-2	20-30	1.40-1.50	0.60-2.00	0.03-0.06	3.0-5.9	0.4-0.6	.05	.32	1	8	0
	2-5	40-55	1.45-1.55	0.06-0.20	0.13-0.15	6.0-8.9	0.2-0.5	.20	.20			
	5-16	40-55	1.40-1.50	0.00-0.06	0.11-0.13	6.0-8.9	0.2-0.5	.20	.20			
	16-26	---	---	---	---	---	---	---	---			
517: Moffat-----	0-6	5-10	1.50-1.60	6.00-20.00	0.08-0.10	0.0-2.9	0.4-0.6	.20	.20	5	2	134
	6-28	8-16	1.45-1.55	2.00-6.00	0.13-0.16	0.0-2.9	0.0-0.5	.43	.28			
	28-47	10-18	1.55-1.65	2.00-6.00	0.13-0.16	0.0-2.9	0.0-0.5	.37	.37			
	47-65	12-27	1.55-1.65	2.00-6.00	0.13-0.16	3.0-5.9	0.0-0.5	.37	.37			
518: Tohatin-----	0-3	4-8	1.45-1.60	6.00-20.00	0.08-0.10	0.0-2.9	0.4-0.6	.20	.20	5	2	134
	3-48	4-10	1.50-1.65	6.00-20.00	0.05-0.10	0.0-2.9	0.3-0.5	.20	.20			
	48-80	4-16	1.45-1.65	2.00-6.00	0.09-0.14	0.0-2.9	0.2-0.4	.24	.24			
Sheppard-----	0-8	4-8	1.45-1.55	6.00-20.00	0.08-0.10	0.0-2.9	0.2-0.6	.20	.20	5	2	134
	8-80	4-8	1.45-1.55	6.00-20.00	0.06-0.09	0.0-2.9	0.2-0.5	.20	.20			
519: Shumbegay-----	0-2	2-5	1.55-1.65	6.00-20.00	0.08-0.10	0.0-2.9	0.2-0.5	.20	.20	5	2	134
	2-6	5-8	1.55-1.65	2.00-6.00	0.08-0.10	0.0-2.9	0.2-0.5	.20	.20			
	6-10	2-5	1.55-1.65	6.00-20.00	0.07-0.09	0.0-2.9	0.2-0.5	.20	.20			
	10-80	3-8	1.55-1.65	2.00-6.00	0.09-0.11	0.0-2.9	0.2-0.5	.20	.20			
520: Rock outcrop-----	0-80	---	---	---	---	---	---	---	---	-	---	---
Needle-----	0-5	2-6	1.50-1.60	6.00-20.00	0.05-0.07	0.0-2.9	0.4-0.6	.17	.17	1	1	220
	5-15	2-8	1.50-1.60	6.00-20.00	0.05-0.07	0.0-2.9	0.2-0.5	.17	.17			
	15-19	---	---	---	---	---	---	---	---			

Table 15.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
521:												
Sandbench-----	0-11	2-6	1.50-1.60	6.00-20.00	0.05-0.07	0.0-2.9	0.2-0.6	.17	.17	2	1	220
	11-17	2-8	1.50-1.60	6.00-20.00	0.06-0.10	0.0-2.9	0.2-0.5	.20	.20			
	17-31	2-8	1.50-1.60	6.00-20.00	0.06-0.10	0.0-2.9	0.2-0.5	.20	.20			
	31-41	---	---	0.00-0.14	---	---	---	---	---			
Sheppard-----	0-4	2-5	1.45-1.55	6.00-20.00	0.05-0.07	0.0-2.9	0.2-0.5	.17	.17	5	1	220
	4-61	4-8	1.45-1.55	6.00-20.00	0.06-0.09	0.0-2.9	0.2-0.5	.20	.20			
522:												
Pennell-----	0-5	4-8	1.50-1.60	6.00-20.00	0.08-0.10	0.0-2.9	0.4-0.6	.20	.20	1	2	134
	5-10	8-18	1.50-1.60	2.00-6.00	0.13-0.15	0.0-2.9	0.3-0.5	.28	.28			
	10-18	10-18	1.50-1.60	2.00-6.00	0.08-0.14	0.0-2.9	0.2-0.5	.17	.17			
	18-22	---	---	---	---	---	---	---	---			
523:												
Tyende-----	0-6	5-8	1.55-1.65	6.00-20.00	0.08-0.10	0.0-2.9	0.3-0.5	.20	.20	2	2	134
	6-10	12-18	1.55-1.65	2.00-6.00	0.10-0.13	0.0-2.9	0.3-0.5	.28	.28			
	10-14	18-24	1.45-1.55	0.60-2.00	0.07-0.09	0.0-2.9	0.3-0.5	.43	.43			
	14-37	10-18	1.55-1.65	2.00-6.00	0.03-0.08	0.0-2.9	0.2-0.4	.37	.37			
	37-41	---	---	---	---	---	---	---	---			
Aneth-----	0-2	4-8	1.50-1.60	6.00-20.00	0.08-0.10	0.0-2.9	0.4-0.6	.20	.20	5	2	134
	2-32	5-10	1.50-1.60	6.00-20.00	0.08-0.10	0.0-2.9	0.2-0.5	.20	.20			
	32-63	10-16	1.45-1.55	2.00-6.00	0.13-0.15	0.0-2.9	0.2-0.5	.32	.32			
Shumbegay-----	0-1	2-5	1.55-1.65	6.00-20.00	0.08-0.10	0.0-2.9	0.2-0.5	.20	.20	5	2	134
	1-5	5-8	1.55-1.65	2.00-6.00	0.08-0.10	0.0-2.9	0.2-0.5	.20	.20			
	5-80	2-5	1.55-1.65	6.00-20.00	0.07-0.09	0.0-2.9	0.2-0.5	.20	.20			
524:												
Uzaneva-----	0-1	30-40	1.30-1.40	0.20-0.60	0.19-0.21	3.0-5.9	0.5-1.0	.32	.32	5	4L	86
	1-13	35-55	1.35-1.55	0.02-0.06	0.16-0.20	6.0-8.9	0.5-1.0	.28	.28			
	13-25	35-55	1.45-1.55	0.06-0.20	0.16-0.20	6.0-8.9	0.2-0.5	.28	.28			
	25-80	27-35	1.40-1.50	0.06-0.20	0.18-0.20	3.0-5.9	0.2-0.5	.32	.32			
525:												
Rock outcrop-----	0-80	---	---	---	---	---	---	---	---	-	---	---

Table 15.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
526: Sandbench-----	0-8	2-6	1.50-1.60	6.00-20.00	0.05-0.07	0.0-2.9	0.2-0.6	.17	.17	2	1	220
	8-19	2-8	1.50-1.60	6.00-20.00	0.06-0.10	0.0-2.9	0.2-0.5	.20	.20			
	19-37	2-8	1.50-1.60	6.00-20.00	0.06-0.10	0.0-2.9	0.2-0.5	.20	.20			
	37-41	---	---	0.00-0.14	---	---	---	---	---			
Rock outcrop-----	0-80	---	---	---	---	---	---	---	---	-	---	---
Piute, cool-----	0-3	4-8	1.50-1.60	6.00-20.00	0.07-0.08	0.0-2.9	0.4-0.6	.10	.20	1	3	86
	3-8	2-8	1.50-1.60	6.00-20.00	0.06-0.09	0.0-2.9	0.2-0.4	.17	.17			
	8-12	---	---	---	---	---	---	---	---			
527: Outpost-----	0-3	20-35	1.25-1.35	0.60-2.00	0.14-0.16	0.0-2.9	0.5-1.0	.32	.32	5	5	56
	3-35	35-60	1.30-1.40	0.06-0.20	0.12-0.18	3.0-5.9	0.5-1.0	.32	.32			
	35-58	8-15	1.60-1.70	2.00-6.00	0.08-0.12	0.0-2.9	0.3-0.5	.32	.32			
	58-80	15-25	1.40-1.50	0.60-2.00	0.11-0.14	0.0-2.9	0.3-0.5	.28	.28			
528: Mack-----	0-3	8-18	1.50-1.60	2.00-6.00	0.12-0.14	0.0-2.9	0.4-0.6	.28	.28	5	3	86
	3-13	18-27	1.45-1.55	0.60-2.00	0.13-0.15	0.0-2.9	0.3-0.5	.32	.32			
	13-51	18-27	1.45-1.55	0.60-2.00	0.13-0.15	0.0-2.9	0.3-0.5	.32	.32			
	51-65	8-18	1.55-1.65	2.00-6.00	0.07-0.09	0.0-2.9	0.3-0.5	.24	.24			
600: Kunz-----	0-4	10-18	1.35-1.45	2.00-6.00	0.09-0.13	0.0-2.9	1.0-3.0	.10	.28	5	6	48
	4-23	20-30	1.45-1.55	0.60-2.00	0.12-0.14	0.0-2.9	0.8-1.0	.24	.32			
	23-38	15-20	1.50-1.60	0.60-2.00	0.10-0.14	0.0-2.9	0.4-0.6	.28	.28			
	38-66	8-15	1.50-1.60	2.00-6.00	0.10-0.12	0.0-2.9	0.3-0.5	.24	.24			
Yahmore-----	0-5	10-14	1.35-1.45	2.00-6.00	0.13-0.15	0.0-2.9	2.0-4.0	.28	.28	5	3	86
	5-33	14-18	1.35-1.45	2.00-6.00	0.13-0.15	0.0-2.9	1.0-2.0	.28	.28			
	33-64	12-27	1.45-1.55	0.60-2.00	0.12-0.15	0.0-2.9	0.5-1.0	.28	.28			
602: Bostwick-----	0-10	10-18	1.25-1.35	2.00-6.00	0.13-0.15	0.0-2.9	1.0-3.0	.28	.28	5	3	86
	10-51	20-35	1.45-1.55	0.60-2.00	0.15-0.20	3.0-5.9	0.5-0.8	.32	.32			
	51-65	12-18	1.45-1.55	2.00-6.00	0.12-0.15	0.0-2.9	0.0-0.5	.28	.28			

Table 15.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
602: Canburn-----	0-10	18-27	1.05-1.15	0.60-2.00	0.19-0.21	0.0-2.9	3.0-5.0	.43	.43	5	8	0
	10-31	27-35	1.15-1.35	0.20-0.60	0.19-0.21	3.0-5.9	1.0-3.0	.37	.37			
	31-43	10-18	1.40-1.50	2.00-6.00	0.13-0.15	0.0-2.9	0.5-1.0	.28	.28			
	43-65	18-27	1.45-1.55	0.20-0.60	0.15-0.19	0.0-2.9	0.3-0.5	.24	.24			
604: Yahmore-----	0-3	10-14	1.35-1.45	2.00-6.00	0.11-0.13	0.0-2.9	2.0-4.0	.24	.24	5	3	86
	3-35	14-18	1.35-1.45	2.00-6.00	0.13-0.15	0.0-2.9	1.0-2.0	.28	.28			
	35-64	12-27	1.45-1.55	0.60-2.00	0.12-0.15	0.0-2.9	0.5-1.0	.28	.28			
Sandark-----	0-5	4-8	1.25-1.35	6.00-20.00	0.09-0.11	0.0-2.9	2.0-3.0	.20	.20	5	2	134
	5-36	2-8	1.35-1.45	6.00-20.00	0.07-0.10	0.0-2.9	1.0-2.0	.20	.20			
	36-66	2-8	1.50-1.60	6.00-20.00	0.06-0.10	0.0-2.9	0.5-1.0	.17	.17			
606: Narbona-----	0-4	3-5	1.35-1.50	6.00-20.00	0.02-0.05	0.0-2.9	1.0-4.0	.02	.10	5	3	86
	4-22	3-8	1.50-1.60	6.00-20.00	0.02-0.05	0.0-2.9	0.5-1.0	.02	.10			
	22-66	18-30	1.45-1.55	0.60-2.00	0.05-0.10	0.0-2.9	0.2-0.5	.10	.32			
Deza-----	0-4	2-6	1.40-1.50	6.00-20.00	0.06-0.08	0.0-2.9	1.0-3.0	.10	.10	5	1	220
	4-31	2-6	1.50-1.60	6.00-20.00	0.05-0.08	0.0-2.9	0.2-0.5	.10	.10			
	31-62	5-10	1.55-1.65	6.00-20.00	0.05-0.08	0.0-2.9	0.1-0.3	.15	.15			
608: Narbona-----	0-7	5-8	1.35-1.50	6.00-20.00	0.02-0.05	0.0-2.9	1.0-4.0	.02	.10	5	5	56
	7-28	3-8	1.50-1.60	6.00-20.00	0.02-0.05	0.0-2.9	0.5-1.0	.02	.10			
	28-63	18-30	1.45-1.55	0.60-2.00	0.05-0.10	0.0-2.9	0.2-0.5	.10	.32			
Zilditloi-----	0-7	2-8	1.50-1.60	5.95-19.98	0.06-0.08	0.0-2.9	0.5-1.0	.17	.17	5	2	134
	7-31	2-8	1.55-1.65	5.95-19.98	0.05-0.08	0.0-2.9	0.2-0.5	.15	.15			
	31-70	2-8	1.60-1.70	5.95-19.98	0.05-0.08	0.0-2.9	0.2-0.5	.15	.15			
610: Kunz-----	0-6	10-18	1.35-1.45	2.00-6.00	0.13-0.15	0.0-2.9	1.0-3.0	.28	.28	5	3	86
	6-26	20-27	1.40-1.50	0.60-2.00	0.14-0.16	0.0-2.9	0.5-1.0	.32	.32			
	26-70	20-35	1.50-1.60	0.20-0.60	0.16-0.18	0.0-2.9	0.3-0.5	.32	.32			

Table 15.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
610:												
Xankey-----	0-6	18-25	1.35-1.45	0.60-2.00	0.07-0.11	0.0-2.9	1.0-2.0	.10	.37	5	7	38
	6-30	20-30	1.40-1.50	0.60-2.00	0.06-0.10	0.0-2.9	0.5-0.8	.10	.32			
	30-63	10-18	1.50-1.60	2.00-6.00	0.09-0.11	0.0-2.9	0.2-0.5	.20	.24			
612:												
Xankey-----	0-6	18-25	1.35-1.45	0.60-2.00	0.07-0.11	0.0-2.9	1.0-2.0	.10	.37	5	7	38
	6-29	20-30	1.40-1.50	0.60-2.00	0.06-0.10	0.0-2.9	0.5-0.8	.10	.32			
	29-64	10-18	1.50-1.60	2.00-6.00	0.09-0.11	0.0-2.9	0.2-0.5	.20	.24			
614:												
Kunz-----	0-2	10-18	1.35-1.45	0.60-2.00	0.07-0.11	0.0-2.9	1.0-3.0	.10	.37	5	7	38
	2-6	12-20	1.40-1.50	0.60-2.00	0.11-0.14	0.0-2.9	1.0-2.0	.20	.37			
	6-28	27-35	1.40-1.50	0.20-0.60	0.17-0.20	3.0-5.9	0.6-0.8	.32	.32			
	28-65	20-27	1.45-1.55	0.60-2.00	0.14-0.16	0.0-2.9	0.0-0.5	.32	.32			
Tuntsa-----	0-9	8-18	1.30-1.40	2.00-6.00	0.13-0.15	0.0-2.9	2.0-4.0	.28	.28	5	3	86
	9-45	8-18	1.30-1.40	2.00-6.00	0.13-0.15	0.0-2.9	1.0-3.0	.32	.32			
	45-63	8-18	1.40-1.50	2.00-6.00	0.12-0.15	0.0-2.9	0.5-1.0	.32	.32			
Yahmore-----	0-9	10-14	1.35-1.45	0.60-2.00	0.16-0.18	0.0-2.9	2.0-4.0	.37	.37	5	5	56
	9-24	14-18	1.35-1.45	2.00-6.00	0.12-0.14	0.0-2.9	1.0-2.0	.28	.28			
	24-64	12-27	1.45-1.55	0.60-2.00	0.12-0.15	0.0-2.9	0.5-1.0	.28	.28			
616:												
Ligai-----	0-2	10-18	1.20-1.30	2.00-6.00	0.03-0.07	0.0-2.9	2.0-4.0	.10	.55	2	8	0
	2-7	20-27	1.35-1.45	0.60-2.00	0.07-0.12	0.0-2.9	1.0-2.0	.10	.32			
	7-25	20-27	1.35-1.45	0.60-2.00	0.05-0.08	0.0-2.9	1.0-2.0	.10	.32			
	25-35	---	---	---	---	---	---	---	---			
Pastorpeak-----	0-4	10-18	0.95-1.05	2.00-6.00	0.07-0.11	0.0-2.9	4.0-7.0	.10	.55	5	6	48
	4-38	18-27	1.25-1.35	0.60-2.00	0.08-0.12	0.0-2.9	2.0-4.0	.10	.37			
	38-64	18-24	1.30-1.35	0.60-2.00	0.03-0.07	0.0-2.9	1.0-2.0	.05	.32			
	64-80	10-18	1.35-1.45	20.00-20.00	0.01-0.02	0.0-2.9	0.5-1.0	---	---			
Rock outcrop-----	0-80	---	---	---	---	---	---	---	---	-	---	---

Table 15.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
618:												
Zibetod-----	0-2	8-15	1.45-1.55	2.00-6.00	0.03-0.06	0.0-2.9	1.0-2.0	.10	.55	1	8	0
	2-14	14-18	1.45-1.55	2.00-6.00	0.03-0.08	0.0-2.9	1.0-2.0	.10	.37			
	14-24	---	---	---	---	---	---	---	---			
Bigpaw-----	0-5	16-20	1.25-1.35	0.60-2.00	0.16-0.18	0.0-2.9	2.0-4.0	.37	.37	5	5	56
	5-48	18-27	1.25-1.35	0.60-2.00	0.15-0.18	3.0-5.9	1.0-4.0	.37	.37			
	48-57	20-27	1.40-1.50	0.60-2.00	0.11-0.14	3.0-5.9	0.5-1.0	.24	.32			
	57-65	18-24	1.40-1.50	0.60-2.00	0.09-0.13	0.0-2.9	0.3-0.5	.20	.28			
700:												
Akhoni-----	0-3	8-18	1.25-1.35	2.00-6.00	0.13-0.15	0.0-2.9	2.0-4.0	.28	.28	1	3	86
	3-17	8-18	1.35-1.45	2.00-6.00	0.12-0.14	0.0-2.9	1.0-2.0	.28	.28			
	17-27	---	---	---	---	---	---	---	---			
Retaw-----	0-3	---	---	0.60-2.00	0.25-0.30	0.0-2.9	20-22	---	---	5	8	0
	3-8	20-27	0.80-1.00	0.20-0.60	0.19-0.21	0.0-2.9	9.0-17	.43	.43			
	8-13	35-45	1.45-1.60	0.06-0.20	0.16-0.20	3.0-5.9	9.0-17	.32	.32			
	13-33	18-45	1.45-1.55	0.00-0.06	0.14-0.16	3.0-5.9	1.0-2.0	.24	.24			
	33-70	10-25	1.55-1.65	0.20-0.60	0.09-0.15	0.0-2.9	0.5-1.0	.24	.24			
702:												
Bikeyah-----	0-5	10-18	1.30-1.40	0.60-2.00	0.16-0.17	0.0-2.9	2.0-4.0	.37	.37	5	5	56
	5-14	10-18	1.30-1.40	0.60-2.00	0.13-0.17	0.0-2.9	2.0-4.0	.32	.32			
	14-29	10-18	1.30-1.40	0.60-2.00	0.11-0.14	0.0-2.9	2.0-4.0	.28	.28			
	29-65	10-25	1.55-1.65	0.60-2.00	0.11-0.15	0.0-2.9	0.5-2.0	.28	.28			
Berland-----	0-2	18-25	1.10-1.20	0.60-2.00	0.14-0.17	0.0-2.9	1.0-3.0	.37	.37	1	6	48
	2-9	20-35	1.25-1.35	0.60-2.00	0.14-0.18	3.0-5.9	1.0-3.0	.37	.37			
	9-19	---	---	---	---	---	---	---	---			
704:												
Klizhin-----	0-4	8-18	1.25-1.35	2.00-6.00	0.13-0.15	0.0-2.9	2.0-4.0	.28	.28	5	5	56
	4-49	10-18	1.35-1.45	2.00-6.00	0.12-0.14	0.0-2.9	1.0-3.0	.28	.28			
	49-56	5-10	1.50-1.60	2.00-6.00	0.05-0.07	0.0-2.9	0.5-1.0	.17	.17			
	56-64	8-18	1.60-1.70	2.00-6.00	0.12-0.14	0.0-2.9	0.2-0.6	.24	.24			

Table 15.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
704: Captom-----	0-8	5-8	1.40-1.50	6.00-20.00	0.03-0.05	0.0-2.9	2.0-4.0	.05	.20	3	5	56
	8-13	5-8	1.50-1.60	6.00-20.00	0.03-0.06	0.0-2.9	0.5-1.0	.05	.20			
	13-32	5-8	1.50-1.60	6.00-20.00	0.05-0.08	0.0-2.9	0.4-0.6	.10	.20			
	32-43	18-27	1.45-1.55	0.60-2.00	0.12-0.15	0.0-2.9	0.3-0.5	.28	.28			
	43-58	15-20	1.45-1.55	2.00-6.00	0.12-0.14	0.0-2.9	0.3-0.5	.24	.24			
	58-68	---	---	---	---	---	---	---	---			
706: Todacheene-----	0-2	10-18	1.30-1.40	2.00-6.00	0.16-0.18	0.0-2.9	3.0-4.0	.37	.37	5	5	56
	2-18	18-27	1.25-1.35	0.60-2.00	0.14-0.18	0.0-2.9	2.0-4.0	.37	.37			
	18-37	18-27	1.35-1.45	0.60-2.00	0.13-0.18	0.0-2.9	1.0-2.0	.32	.32			
	37-80	10-27	1.50-1.60	0.60-6.00	0.06-0.13	0.0-2.9	0.5-1.0	.15	.28			
Viewpoint-----	0-3	14-18	1.20-1.30	2.00-6.00	0.11-0.14	0.0-2.9	3.0-6.0	.20	.37	1	6	48
	3-7	18-27	1.20-1.30	0.60-2.00	0.09-0.12	0.0-2.9	2.0-4.0	.20	.37			
	7-17	20-35	1.30-1.40	0.60-2.00	0.09-0.14	3.0-5.9	1.0-2.0	.15	.32			
	17-27	---	---	---	---	---	---	---	---			
Owlspring-----	0-5	14-20	1.25-1.35	0.60-2.00	0.15-0.17	0.0-2.9	2.0-4.0	.37	.37	5	5	56
	5-25	20-35	1.20-1.40	0.20-0.60	0.16-0.19	3.0-5.9	2.0-8.0	.37	.37			
	25-43	20-35	1.45-1.55	0.20-0.60	0.13-0.15	3.0-5.9	0.5-1.0	.32	.32			
	43-66	16-20	1.45-1.55	2.00-6.00	0.11-0.14	0.0-2.9	0.3-0.6	.28	.28			
	66-72	8-18	1.45-1.55	2.00-6.00	0.08-0.11	0.0-2.9	0.2-0.5	.10	.28			
	72-81	8-18	1.45-1.55	2.00-6.00	0.14-0.16	0.0-2.9	0.1-0.3	.43	.43			
708: Tunitcha-----	0-5	10-18	1.25-1.35	2.00-6.00	0.05-0.08	0.0-2.9	1.0-4.0	.10	.24	3	6	48
	5-8	10-18	1.35-1.45	2.00-6.00	0.07-0.09	0.0-2.9	1.0-4.0	.15	.24			
	8-38	20-27	1.40-1.50	0.60-2.00	0.12-0.14	0.0-2.9	0.5-1.0	.32	.32			
	38-57	10-18	1.40-1.50	2.00-6.00	0.11-0.13	0.0-2.9	0.4-0.6	.24	.24			
	57-67	---	---	---	---	---	---	---	---			
Bangston-----	0-7	4-8	1.45-1.55	6.00-20.00	0.06-0.08	0.0-2.9	2.0-3.0	.17	.17	5	2	134
	7-26	4-8	1.45-1.55	6.00-20.00	0.06-0.08	0.0-2.9	1.0-3.0	.17	.17			
	26-43	4-8	1.50-1.60	6.00-20.00	0.04-0.07	0.0-2.9	0.8-1.0	.10	.17			
	43-66	4-8	1.50-1.60	6.00-20.00	0.03-0.05	0.0-2.9	0.4-6.0	.05	.17			

Table 15.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								Kw	Kf	T		
	In	Pct	g/cc	In/hr	In/in	Pct	Pct					
710: Akhoni-----	0-2	8-18	1.25-1.35	2.00-6.00	0.13-0.15	0.0-2.9	2.0-4.0	.28	.28	1	3	86
	2-13	8-18	1.35-1.45	2.00-6.00	0.12-0.14	0.0-2.9	1.0-2.0	.28	.28			
	13-17	---	---	---	---	---	---	---	---			
Klizhin-----	0-7	8-18	1.25-1.35	2.00-6.00	0.13-0.15	0.0-2.9	2.0-4.0	.28	.28	3	3	86
	7-22	8-18	1.25-1.35	2.00-6.00	0.13-0.15	0.0-2.9	1.0-3.0	.28	.28			
	22-45	8-18	1.35-1.45	2.00-6.00	0.11-0.14	0.0-2.9	0.5-2.0	.24	.24			
	45-55	---	---	---	---	---	---	---	---			
712: Sonsela-----	0-4	10-18	1.10-1.20	2.00-6.00	0.06-0.10	0.0-2.9	3.0-4.0	.10	.28	5	6	48
	4-9	10-18	1.30-1.40	2.00-6.00	0.09-0.15	0.0-2.9	1.0-2.0	.20	.28			
	9-26	18-27	1.45-1.55	0.60-2.00	0.07-0.10	0.0-2.9	0.5-1.0	.10	.28			
	26-48	18-27	1.45-1.55	0.60-2.00	0.06-0.10	0.0-2.9	0.4-0.6	.10	.28			
	48-70	18-27	1.35-1.45	0.60-2.00	0.03-0.06	0.0-2.9	0.2-0.5	.05	.28			
Washpass-----	0-12	8-12	1.30-1.40	2.00-6.00	0.12-0.14	0.0-2.9	2.0-4.0	.28	.28	5	3	86
	12-36	10-18	1.45-1.55	2.00-6.00	0.09-0.13	0.0-2.9	0.5-1.0	.20	.28			
	36-57	14-18	1.60-1.70	2.00-6.00	0.05-0.09	0.0-2.9	0.4-0.6	.10	.28			
	57-85	10-18	1.45-1.55	2.00-6.00	0.10-0.15	0.0-2.9	0.3-0.5	.28	.37			
Viewpoint-----	0-3	14-18	1.20-1.30	2.00-6.00	0.07-0.11	0.0-2.9	3.0-6.0	.10	.37	1	7	38
	3-9	18-27	1.20-1.30	0.60-2.00	0.09-0.12	0.0-2.9	2.0-4.0	.20	.37			
	9-14	20-35	1.30-1.40	0.60-2.00	0.09-0.14	3.0-5.9	1.0-2.0	.15	.32			
	14-18	---	---	---	---	---	---	---	---			
W: Water-----	---	---	---	---	---	---	---	---	---	-	---	---

Table 16.--Chemical Properties of the Soils

(Absence of an entry indicates that data were not estimated.)

Map symbol and soil name	Depth	Cation exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	In	meq/100 g	pH	Pct	Pct	mmhos/cm	
100: Werito-----	0-3	10-15	7.9-8.4	3-5	---	0.0-2.0	0-5
	3-7	15-20	8.5-9.0	3-5	---	0.0-4.0	5-13
	7-17	15-20	7.9-9.0	3-10	---	2.0-4.0	13-30
	17-22	15-30	6.1-7.8	1-3	5-10	4.0-8.0	13-30
	22-34	15-30	3.6-6.0	0-1	0-1	4.0-8.0	13-30
	34-44	---	---	---	---	---	---
102: Blackston-----	0-3	5.0-10	7.9-8.4	1-5	---	0.0-2.0	0-5
	3-9	5.0-10	7.9-9.0	5-10	---	0.0-2.0	5-13
	9-15	10-20	7.9-9.0	10-15	---	2.0-4.0	5-13
	15-35	5.0-10	7.9-8.4	5-10	---	2.0-4.0	0-5
	35-70	0.0-1.0	7.9-8.4	1-5	---	0.0-2.0	0-1
Camac-----	0-3	5.0-10	7.9-8.4	5-10	---	0.0-4.0	0-5
	3-17	5.0-15	7.9-9.0	5-15	---	0.0-4.0	0-5
	17-31	10-20	7.9-9.0	10-15	0-1	4.0-8.0	5-13
	31-41	---	---	---	---	---	---
Rock outcrop-----	0-80	---	---	---	---	---	---
105: Hamburn-----	0-3	15-25	7.4-8.4	3-5	---	0.0-2.0	0-5
	3-9	10-20	7.4-8.4	1-3	---	2.0-4.0	5-13
	9-24	15-25	7.4-9.0	1-3	0-1	4.0-16.0	13-30
	24-70	15-20	7.9-9.0	1-5	0-1	4.0-25.0	13-45
107: Tocito-----	0-2	5.0-10	7.4-7.8	5-10	0-1	2.0-4.0	0-5
	2-16	10-15	7.9-8.4	5-10	0-1	2.0-4.0	0-5
	16-63	10-15	7.9-8.4	10-15	1-5	4.0-8.0	0-5
Gullied land-----	0-3	8.0-15	---	5-10	1-5	2.0-4.0	0-5
	3-80	8.0-15	---	5-10	1-5	4.0-8.0	0-5
110: Brimhall-----	0-2	2.0-5.0	7.4-8.4	2-5	---	0.0-2.0	---
	2-21	5.0-10	7.9-8.4	5-20	0-1	0.0-2.0	0-5
	21-29	5.0-10	7.9-8.4	5-10	1-5	2.0-4.0	0-5
	29-49	5.0-10	7.9-8.4	1-5	15-30	4.0-16.0	5-35
	49-59	---	---	---	---	---	---
Benally-----	0-1	10-15	7.9-8.4	3-5	---	0.0-4.0	5-13
	1-11	10-20	8.5-9.6	3-5	---	2.0-8.0	13-30
	11-31	10-20	8.5-9.6	5-10	0-15	8.0-16.0	30-50
	31-52	10-15	6.6-8.4	3-5	5-15	8.0-16.0	30-50
	52-62	---	---	---	---	---	---
Genats-----	0-4	2.0-5.0	7.4-7.8	1-3	0-1	2.0-4.0	0-5
	4-13	15-30	7.4-9.0	0-1	1-5	4.0-8.0	13-30
	13-27	15-30	6.1-7.8	---	1-3	8.0-16.0	13-30
	27-37	---	---	---	---	---	---

Table 16.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	In	meq/100 g	pH	Pct	Pct	mmhos/cm	
113: Gyptur-----	0-2	5.0-10	7.4-8.4	5-10	---	2.0-4.0	0-5
	2-5	10-20	7.9-9.0	5-15	0-2	2.0-4.0	5-13
	5-17	10-20	7.9-9.0	5-15	10-25	2.0-8.0	5-13
	17-46	10-20	7.9-9.0	5-15	5-10	8.0-25.0	13-50
	46-56	---	---	---	---	---	---
115: Denazar-----	0-14	1.0-1.0	6.6-7.8	0-5	---	0.0-2.0	0-1
	14-31	1.0-1.0	7.9-9.0	5-15	---	2.0-4.0	0-5
	31-42	1.0-1.0	7.4-8.4	1-5	---	2.0-4.0	0-1
	42-52	---	---	---	---	---	---
Farb-----	0-6	0.0-1.0	7.4-8.4	0-1	---	0.0-2.0	0-1
	6-10	2.0-10	7.4-8.4	3-10	---	2.0-4.0	0-5
	10-14	---	---	---	---	---	---
117: Badland-----	0-60	---	---	---	---	---	---
Rock outcrop-----	0-80	---	---	---	---	---	---
120: Nageezi-----	0-4	5.0-10	7.9-8.4	1-3	---	0.0-2.0	0-5
	4-14	5.0-10	7.9-8.4	2-8	---	0.0-2.0	0-5
	14-32	5.0-10	7.9-9.0	10-50	---	2.0-4.0	0-13
	32-48	5.0-10	7.9-9.0	15-35	---	4.0-8.0	5-13
	48-64	2.0-5.0	7.9-9.0	5-10	---	4.0-8.0	5-13
Denazar-----	0-11	1.0-1.0	6.6-7.8	0-3	---	0.0-2.0	0-1
	11-34	2.0-5.0	7.9-9.0	5-15	---	2.0-4.0	0-5
	34-62	2.0-5.0	7.9-9.0	15-50	---	2.0-4.0	0-5
122: Blueflat-----	0-2	10-15	7.9-8.4	5-10	0-1	2.0-4.0	0-5
	2-7	15-20	7.9-8.4	5-10	0-2	4.0-8.0	5-13
	7-14	15-20	7.4-7.8	5-10	10-20	4.0-8.0	5-13
	14-27	15-20	6.6-7.8	1-5	5-10	8.0-16.0	13-30
	27-37	---	---	---	---	---	---
Notal-----	0-3	15-20	7.9-9.0	5-10	0-1	2.0-4.0	5-13
	3-13	15-30	7.9-9.0	5-10	0-1	4.0-8.0	5-13
	13-70	15-25	7.9-9.0	5-10	1-5	4.0-16.0	13-30
125: Kimbeto-----	0-3	2.0-5.0	7.4-8.4	0-1	---	0.0-2.0	0-1
	3-10	5.0-10	7.9-8.4	1-5	---	0.0-2.0	0-5
	10-18	10-15	7.9-9.6	5-10	---	0.0-2.0	0-5
	18-29	5.0-10	7.9-9.0	10-30	---	2.0-8.0	5-25
	29-42	2.0-10	7.9-9.0	5-15	0-5	4.0-16.0	13-30
	42-52	---	---	---	---	---	---

Table 16.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	In	meq/100 g	pH	Pct	Pct	mmhos/cm	
130: Badland-----	0-60	---	---	---	---	---	---
Genats-----	0-3	5.0-10	7.4-7.8	1-3	0-1	2.0-4.0	5-13
	3-9	15-30	7.4-9.0	0-1	1-5	4.0-8.0	13-30
	9-22	15-30	6.1-7.8	---	1-3	8.0-16.0	13-30
	22-26	---	---	---	---	---	---
133: Razito-----	0-10	0.0-1.0	6.6-7.3	0-1	---	0.0-1.0	0-1
	10-70	2.0-5.0	7.4-8.4	1-3	---	0.0-2.0	0-5
135: Farb-----	0-2	2.0-5.0	7.4-8.4	1-3	---	0.0-2.0	0-5
	2-5	2.0-10	7.4-8.4	3-5	---	0.0-2.0	0-5
	5-8	2.0-10	7.4-8.4	3-10	---	2.0-4.0	0-5
	8-18	---	---	---	---	---	---
Rock outcrop-----	0-80	---	---	---	---	---	---
Badland-----	0-60	---	---	---	---	---	---
137: Persayo-----	0-2	10-15	7.9-8.4	3-5	0-2	2.0-4.0	0-5
	2-17	15-20	7.4-9.0	3-15	2-10	4.0-16.0	5-13
	17-21	---	---	---	---	---	---
Cairn-----	0-2	5.0-10	7.9-8.4	15-25	---	2.0-4.0	0-5
	2-9	10-20	7.9-8.4	15-25	---	2.0-4.0	0-5
	9-19	10-15	7.9-9.0	40-70	0-5	2.0-4.0	5-13
	19-46	5.0-10	7.4-7.8	15-50	20-50	2.0-8.0	0-5
	46-56	---	---	---	---	---	---
Patel-----	0-1	10-15	7.9-8.4	15-20	0-1	0.0-2.0	0-5
	1-8	20-25	8.5-9.0	5-20	0-1	2.0-4.0	13-30
	8-24	20-25	8.5-9.0	5-15	0-2	8.0-16.0	13-30
	24-37	15-20	7.4-8.4	5-10	5-15	8.0-16.0	13-30
	37-47	---	---	---	---	---	---
140: Benally-----	0-4	2.0-5.0	7.4-8.4	1-3	---	0.0-2.0	0-5
	4-15	5.0-10	7.9-9.0	1-3	---	0.0-2.0	5-13
	15-56	10-20	8.5-9.0	3-5	1-3	4.0-8.0	13-30
	56-64	2.0-5.0	7.9-8.4	1-3	0-1	4.0-8.0	5-13
142: Bebeevar-----	0-4	1.0-1.0	7.4-8.4	1-3	---	2.0-4.0	0-5
	4-70	1.0-1.0	7.4-8.4	1-5	---	2.0-4.0	0-5
Walrees-----	0-4	10-15	7.9-8.4	1-3	---	4.0-8.0	0-5
	4-30	10-15	7.9-8.4	2-5	---	4.0-8.0	0-5
	30-62	0.0-1.0	7.9-8.4	0-1	---	2.0-4.0	0-5
145: Razito-----	0-8	2.0-5.0	7.4-8.4	0-1	---	0.0-1.0	0-1
	8-62	2.0-5.0	7.4-8.4	1-3	---	0.0-2.0	0-5

Table 16.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	In	meq/100 g	pH	Pct	Pct	mmhos/cm	
145: Huerfano-----	0-1	10-15	8.5-9.0	3-5	---	2.0-4.0	5-13
	1-11	10-20	8.5-9.0	3-10	0-1	4.0-8.0	30-60
	11-18	10-20	7.9-8.4	2-5	1-5	8.0-16.0	13-30
	18-28	---	---	---	---	---	---
147: Escavada-----	0-5	0.0-1.0	7.4-8.4	1-3	---	0.0-2.0	0-1
	5-70	1.0-1.0	7.4-9.0	1-3	---	0.0-2.0	0-5
150: Chipeta-----	0-2	10-20	8.5-9.0	3-5	0-1	4.0-16.0	13-30
	2-10	15-30	8.5-9.0	3-5	1-5	16.0-25.0	30-60
	10-20	---	---	---	---	---	---
Badland-----	0-60	---	---	---	---	---	---
Moncisco-----	0-2	10-15	7.4-8.4	1-3	---	0.0-2.0	0-1
	2-11	5.0-15	7.4-8.4	5-20	---	4.0-8.0	0-5
	11-70	0.0-1.0	7.4-8.4	0-3	0-2	0.0-2.0	0-1
153: Green River-----	0-6	10-15	7.9-8.4	3-5	---	2.0-4.0	0-5
	6-10	15-20	7.9-8.4	5-10	0-1	2.0-4.0	0-5
	10-55	5.0-10	7.9-8.4	5-10	0-1	4.0-8.0	5-13
	55-68	1.0-1.0	7.9-8.4	1-3	---	2.0-4.0	0-5
Green River, saline--	0-2	10-15	7.9-8.4	3-5	---	2.0-4.0	0-5
	2-16	5.0-10	8.5-9.0	5-10	0-1	4.0-8.0	5-13
	16-52	5.0-10	7.9-9.0	5-10	0-1	8.0-20.0	5-13
	52-66	2.0-5.0	7.9-8.4	3-5	0-1	4.0-8.0	5-13
155: Mesa-----	0-2	5.0-10	7.4-8.4	3-5	---	0.0-2.0	0-1
	2-21	10-15	7.4-8.4	5-15	---	0.0-2.0	0-1
	21-37	5.0-10	7.9-9.0	15-40	---	2.0-4.0	0-5
	37-47	5.0-10	7.9-9.0	5-15	---	2.0-4.0	0-5
	47-63	10-20	7.9-9.0	5-15	0-1	2.0-4.0	5-13
157: Werjo, saline-----	0-4	10-15	8.5-9.0	3-5	0-1	4.0-8.0	5-13
	4-12	10-15	8.5-9.0	5-10	0-1	16.0-25.0	13-30
	12-66	10-15	8.5-9.0	5-10	0-1	16.0-25.0	13-30
Werjo-----	0-6	10-15	7.9-8.4	3-5	---	2.0-4.0	0-5
	6-12	10-15	7.9-8.4	5-10	0-1	2.0-4.0	0-5
	12-70	10-15	7.9-8.4	5-10	0-1	2.0-8.0	5-13
160: Notal-----	0-3	15-20	7.9-9.0	5-10	0-1	2.0-4.0	5-13
	3-11	15-30	7.9-9.0	5-10	0-1	4.0-8.0	5-13
	11-70	15-25	7.9-9.0	5-10	1-5	4.0-16.0	13-30
Escavada-----	0-2	2.0-10	7.4-8.4	1-5	---	0.0-2.0	0-5
	2-70	1.0-1.0	7.4-9.0	1-5	---	4.0-8.0	0-5
Riverwash-----	0-6	0.0-1.0	---	---	---	---	---
	6-60	0.0-1.0	---	---	---	---	---

Table 16.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	In	meq/100 g	pH	Pct	Pct	mmhos/cm	
163:							
Werlog-----	0-2	15-20	7.9-8.4	3-5	0-1	16.0-50.0	13-30
	2-12	10-15	7.9-8.4	3-5	0-1	8.0-16.0	13-30
	12-65	15-20	7.9-8.4	3-5	0-1	4.0-8.0	5-13
165:							
Jeddito-----	0-9	2.0-7.0	7.9-8.4	---	---	0.0-4.0	---
	9-27	3.0-9.0	7.9-9.0	---	---	4.0-8.0	---
	27-60	4.0-10	7.9-9.0	---	---	4.0-8.0	---
Escavada-----	0-4	2.0-10	7.4-8.4	1-5	---	0.0-2.0	0-5
	4-70	1.0-1.0	7.4-9.0	1-5	---	4.0-8.0	0-5
167:							
Hoskay-----	0-2	10-15	7.9-8.4	5-10	---	2.0-4.0	0-5
	2-6	15-25	8.5-9.0	5-10	0-1	2.0-4.0	13-30
	6-14	15-25	7.9-9.0	5-10	5-10	4.0-8.0	13-30
	14-27	15-25	7.4-8.4	5-10	15-25	8.0-16.0	5-30
	27-65	15-25	7.9-8.4	5-10	5-10	8.0-16.0	5-30
Patel-----	0-2	15-20	7.9-8.4	5-10	0-1	0.0-2.0	0-5
	2-12	20-25	8.5-9.0	5-20	0-1	2.0-4.0	13-30
	12-16	20-25	8.5-9.0	5-15	0-2	8.0-16.0	13-30
	16-33	15-20	7.4-8.4	5-10	5-15	8.0-16.0	13-30
	33-37	---	---	---	---	---	---
Badland-----	0-60	---	---	---	---	---	---
170:							
Notal-----	0-2	10-15	7.9-8.4	5-10	0-1	4.0-8.0	5-13
	2-24	15-30	7.9-9.0	5-10	0-1	4.0-8.0	5-13
	24-66	15-25	7.9-9.0	5-10	1-5	4.0-16.0	13-30
173:							
Shiprock-----	0-11	5.0-10	7.9-8.4	1-3	---	0.0-1.0	0-1
	11-43	5.0-10	7.9-9.0	3-5	---	0.0-1.0	0-5
	43-70	5.0-10	7.9-9.0	3-5	---	0.0-1.0	0-5
175:							
Suwanee-----	0-6	10-15	7.9-8.4	5-10	---	0.0-2.0	0-5
	6-64	10-20	7.9-8.4	5-10	0-1	2.0-4.0	0-5
177:							
Notal-----	0-6	15-20	7.9-9.0	5-10	0-1	2.0-4.0	5-13
	6-11	15-30	7.9-9.0	5-10	0-1	4.0-8.0	5-13
	11-70	15-25	7.9-9.0	5-10	1-5	4.0-16.0	13-30
180:							
Kimbeto-----	0-9	2.0-5.0	7.4-8.4	0-1	---	0.0-2.0	0-1
	9-17	5.0-10	7.9-8.4	1-5	---	0.0-2.0	0-5
	17-25	10-15	7.9-9.6	5-10	---	0.0-2.0	0-5
	25-32	5.0-10	7.9-9.0	10-30	---	2.0-8.0	5-25
	32-44	2.0-10	7.9-9.0	5-15	0-5	4.0-16.0	13-30
	44-48	---	---	---	---	---	---

Table 16.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	In	meq/100 g	pH	Pct	Pct	mmhos/cm	
180: Huerfano-----	0-2	5.0-10	7.4-8.4	1-3	---	0.0-2.0	0-5
	2-9	10-20	8.5-9.0	3-10	0-1	4.0-8.0	30-60
	9-18	10-20	7.9-8.4	2-5	1-5	8.0-16.0	13-30
	18-22	---	---	---	---	---	---
183: Gyptur-----	0-2	10-15	7.9-8.4	5-10	0-5	2.0-4.0	0-5
	2-25	10-15	7.9-8.4	5-10	10-15	8.0-25.0	13-30
	25-65	10-15	7.9-8.4	5-10	5-10	8.0-16.0	13-30
190: Jeddito-----	0-5	2.0-5.0	7.4-8.4	1-3	---	0.0-2.0	0-5
	5-16	2.0-5.0	7.4-8.4	1-3	---	0.0-2.0	0-5
	16-70	5.0-10	7.4-8.4	3-5	0-1	2.0-4.0	5-13
195: Tewa-----	0-3	5.0-10	7.9-8.4	3-5	---	0.0-2.0	0-5
	3-27	10-15	7.9-8.4	5-10	0-1	2.0-4.0	0-5
	27-66	10-15	7.9-8.4	5-10	1-5	4.0-8.0	5-13
200: Tocito-----	0-6	10-15	7.9-8.4	5-10	0-1	2.0-4.0	0-5
	6-12	10-15	7.9-8.4	5-10	0-1	2.0-4.0	0-5
	12-16	15-20	7.9-8.4	5-10	1-5	4.0-8.0	5-13
	16-28	10-15	7.9-8.4	10-15	1-5	4.0-8.0	0-5
	28-70	10-20	7.9-8.4	10-15	1-5	4.0-8.0	5-13
205: Shiprock-----	0-3	2.0-5.0	7.9-8.4	1-3	---	0.0-2.0	---
	3-36	5.0-10	7.9-9.0	3-5	---	2.0-4.0	0-5
	36-66	5.0-10	7.9-9.0	3-5	---	4.0-8.0	5-13
Farb-----	0-2	0.0-1.0	7.4-8.4	0-1	---	0.0-2.0	---
	2-10	2.0-10	7.4-8.4	3-5	---	0.0-2.0	0-5
	10-14	---	---	---	---	---	---
210: Mack-----	0-2	5.0-10	7.4-7.8	3-5	---	0.0-1.0	0-1
	2-8	5.0-10	7.4-7.8	5-10	---	0.0-2.0	0-1
	8-24	10-15	7.9-8.4	15-30	---	0.0-2.0	0-5
	24-65	5.0-10	7.9-9.0	10-40	---	2.0-4.0	0-5
Mesa-----	0-3	5.0-10	7.4-8.4	3-5	---	0.0-2.0	0-1
	3-32	10-15	7.4-8.4	5-15	---	0.0-2.0	0-1
	32-57	5.0-10	7.9-9.0	15-40	---	2.0-4.0	0-5
	57-64	5.0-10	7.9-9.0	5-15	---	2.0-4.0	0-5
215: Persayo-----	0-2	5.0-10	7.9-8.4	3-5	0-2	2.0-4.0	0-5
	2-18	10-15	7.4-9.0	3-15	2-10	4.0-16.0	5-13
	18-22	---	---	---	---	---	---
Fordbutte-----	0-4	5.0-10	7.9-8.4	5-15	0-1	2.0-4.0	0-5
	4-26	5.0-15	7.9-9.0	15-20	0-1	2.0-4.0	5-30
	26-34	5.0-15	7.9-9.0	15-20	1-3	4.0-8.0	5-13
	34-44	---	---	---	---	---	---

Table 16.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	In	meq/100 g	pH	Pct	Pct	mmhos/cm	
220: Chinde-----	0-2	10-15	7.4-8.4	3-5	0-5	4.0-8.0	5-13
	2-9	15-20	7.4-8.4	3-5	10-20	8.0-16.0	13-60
	9-33	15-25	8.5-9.0	3-5	0-1	8.0-16.0	30-60
	33-64	15-25	8.5-9.0	3-5	0-1	16.0-30.0	80-160
230: Ravola-----	0-10	5.0-10	7.9-8.4	5-15	---	0.0-2.0	0-5
	10-70	10-15	7.9-8.4	10-15	0-2	0.0-4.0	0-5
235: Wingrock-----	0-5	2.0-5.0	7.9-8.4	3-10	---	0.0-2.0	0-1
	5-12	5.0-10	8.5-9.0	5-10	---	2.0-4.0	0-5
	12-36	2.0-10	8.5-9.0	5-10	---	2.0-4.0	0-5
	36-70	5.0-10	8.5-9.0	5-10	---	4.0-8.0	5-13
Rock outcrop-----	0-80	---	---	---	---	---	---
240: Nageezi-----	0-2	5.0-10	7.9-8.4	1-3	---	0.0-2.0	0-5
	2-12	5.0-10	7.9-8.4	2-8	---	0.0-2.0	0-5
	12-42	5.0-10	7.9-9.0	10-50	---	2.0-4.0	0-13
	42-64	2.0-5.0	7.9-9.0	5-10	---	4.0-8.0	5-13
245: Tsebitai-----	0-5	5.0-10	7.4-8.4	5-10	0-1	0.0-2.0	0-1
	5-26	5.0-10	7.4-8.4	5-10	0-1	0.0-2.0	0-1
	26-64	5.0-10	7.4-8.4	5-10	2-5	2.0-8.0	0-5
250: Littlehat-----	0-2	5.0-15	7.9-9.0	10-20	1-10	4.0-16.0	13-30
	2-31	5.0-15	7.9-9.0	10-20	1-5	8.0-35.0	30-100
	31-41	---	---	---	---	---	---
Persayo-----	0-2	5.0-10	7.9-8.4	3-5	0-2	2.0-4.0	0-5
	2-6	10-15	7.4-9.0	3-15	2-10	4.0-16.0	5-13
	6-17	15-20	7.4-9.0	3-15	2-10	4.0-16.0	5-13
	17-21	---	---	---	---	---	---
Nataani-----	0-3	5.0-10	7.4-8.4	5-10	0-1	2.0-4.0	0-5
	3-9	5.0-10	7.9-8.4	10-15	0-1	2.0-4.0	0-5
	9-21	5.0-10	7.4-8.4	5-15	15-45	2.0-16.0	0-13
	21-30	5.0-10	7.9-8.4	5-15	1-5	8.0-16.0	5-13
	30-40	---	---	---	---	---	---
255: Benally-----	0-3	5.0-10	7.4-7.8	3-5	0-1	2.0-4.0	5-13
	3-14	10-15	7.9-9.0	5-10	0-5	4.0-8.0	13-50
	14-41	15-20	8.5-9.0	3-5	5-10	16.0-25.0	30-50
	41-65	15-20	7.9-8.4	3-5	5-10	16.0-25.0	50-80
260: Littlehat-----	0-2	5.0-15	7.9-9.0	10-20	1-10	4.0-16.0	13-30
	2-36	5.0-15	7.9-9.0	10-20	1-5	8.0-35.0	30-100
	36-40	---	---	---	---	---	---

Table 16.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	In	meq/100 g	pH	Pct	Pct	mmhos/cm	
260:							
Persayo-----	0-2	5.0-10	7.9-8.4	3-5	0-2	2.0-4.0	0-5
	2-6	10-15	7.4-9.0	3-15	2-10	4.0-16.0	5-13
	6-18	15-20	7.4-9.0	3-15	2-10	4.0-16.0	5-13
	18-22	---	---	---	---	---	---
Badland-----	0-60	---	---	---	---	---	---
265:							
Camac-----	0-3	5.0-10	7.9-8.4	5-10	---	0.0-4.0	0-5
	3-16	5.0-15	7.9-9.0	5-15	---	0.0-4.0	0-5
	16-34	10-20	7.9-9.0	10-15	0-1	4.0-8.0	5-13
	34-38	---	---	---	---	---	---
Kimbeto-----	0-2	5.0-10	7.4-7.8	3-5	---	0.0-2.0	0-5
	2-10	10-15	7.9-9.0	5-10	---	2.0-4.0	0-5
	10-54	10-15	7.9-9.0	10-30	0-2	4.0-16.0	5-30
	54-66	10-15	7.4-8.4	5-15	2-5	8.0-16.0	13-30
Badland-----	0-60	---	---	---	---	---	---
270:							
Fruitland-----	0-7	10-15	7.4-8.4	3-5	---	2.0-4.0	0-1
	7-42	5.0-10	7.4-8.4	3-5	---	2.0-4.0	0-5
	42-65	10-15	7.4-8.4	3-5	0-1	2.0-4.0	0-5
275:							
Razito-----	0-6	2.0-5.0	7.4-8.4	0-1	---	0.0-2.0	0-1
	6-70	2.0-5.0	7.4-8.4	1-3	---	0.0-2.0	0-5
285:							
Water-----	---	---	---	---	---	---	---
Riverwash-----	0-6	0.0-1.0	---	---	---	---	---
	6-60	0.0-1.0	---	---	---	---	---
290:							
Mesa-----	0-12	15-25	7.4-7.8	3-5	---	2.0-4.0	0-1
	12-25	10-20	7.9-8.4	5-15	---	2.0-4.0	0-1
	25-31	10-15	7.9-9.0	15-25	---	2.0-4.0	0-5
	31-37	10-15	7.9-9.0	10-20	---	2.0-4.0	0-5
	37-68	2.0-10	7.4-8.4	3-10	---	0.0-2.0	0-1
295:							
Mesa-----	0-16	10-20	7.4-7.8	3-5	---	2.0-4.0	0-1
	16-29	10-20	7.9-8.4	5-15	---	2.0-4.0	0-1
	29-35	10-15	7.9-9.0	15-25	---	2.0-4.0	0-5
	35-49	10-15	7.9-9.0	10-20	---	2.0-4.0	0-5
	49-80	2.0-10	7.4-8.4	3-10	---	0.0-2.0	0-1
300:							
Farview-----	0-2	5.0-10	7.4-8.4	5-10	---	0.0-2.0	0-1
	2-9	5.0-10	7.9-8.4	15-20	---	2.0-4.0	0-1
	9-13	---	---	---	---	---	---
Rock outcrop-----	0-80	---	---	---	---	---	---

Table 16.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	In	meq/100 g	pH	Pct	Pct	mmhos/cm	
301:							
Farview-----	0-2	5.0-10	7.4-8.4	5-10	---	0.0-2.0	0-1
	2-6	5.0-10	7.9-8.4	15-20	---	2.0-4.0	0-1
	6-16	---	---	---	---	---	---
Sanostee-----	0-2	2.0-5.0	7.4-7.8	0-3	---	0.0-2.0	0-1
	2-15	10-15	7.9-9.0	1-15	---	2.0-4.0	0-5
	15-24	5.0-15	7.9-9.0	15-40	---	4.0-8.0	5-13
	24-32	5.0-15	7.9-9.0	5-10	0-5	4.0-8.0	5-13
	32-42	---	---	---	---	---	---
Rock outcrop-----	0-80	---	---	---	---	---	---
302:							
Doakum-----	0-2	5.0-10	7.4-7.8	0-1	---	0.0-2.0	0-1
	2-16	10-15	7.9-8.4	0-10	---	2.0-4.0	0-5
	16-53	10-15	8.5-9.0	5-10	---	4.0-8.0	5-13
	53-63	---	---	---	---	---	---
303:							
Snapill-----	0-3	5.0-10	7.4-7.8	3-5	---	0.0-2.0	0-5
	3-13	10-15	7.4-8.4	5-15	---	2.0-4.0	5-13
	13-38	10-15	7.9-9.0	10-40	---	2.0-4.0	5-30
	38-53	5.0-10	7.9-9.0	5-20	---	4.0-8.0	5-30
	53-63	---	---	---	---	---	---
304:							
Farview-----	0-2	5.0-10	7.4-8.4	5-10	---	0.0-2.0	0-1
	2-6	5.0-10	7.9-8.4	15-20	---	2.0-4.0	0-1
	6-16	---	---	---	---	---	---
Beclabito-----	0-4	5.0-10	7.9-8.4	5-10	---	0.0-2.0	0-5
	4-14	10-15	8.5-9.0	5-10	---	2.0-4.0	5-13
	14-36	10-15	8.5-9.0	15-30	---	4.0-8.0	5-30
	36-45	5.0-15	8.5-9.0	5-20	---	8.0-16.0	13-30
	45-56	15-25	8.5-9.0	5-20	---	8.0-16.0	13-30
	56-66	---	---	---	---	---	---
Rock outcrop-----	0-80	---	---	---	---	---	---
305:							
Strych-----	0-3	5.0-15	7.9-8.4	5-10	---	0.0-2.0	0-1
	3-15	5.0-15	7.9-8.4	10-15	---	0.0-2.0	0-5
	15-47	5.0-15	7.9-9.0	10-15	---	0.0-2.0	5-13
	47-64	5.0-10	7.9-9.0	5-10	---	0.0-2.0	5-13
Eagleeye-----	0-2	15-20	7.4-8.4	1-5	---	2.0-4.0	---
	2-8	20-25	7.4-8.4	1-3	0-2	4.0-8.0	0-5
	8-18	20-25	7.4-8.4	0-1	2-5	4.0-16.0	5-13
	18-28	---	---	---	---	---	---
Rock outcrop-----	0-80	---	---	---	---	---	---
306:							
Arches-----	0-3	3.0-5.0	7.9-8.4	1-3	---	0.0-1.0	0-1
	3-14	3.0-5.0	7.9-8.4	2-5	---	0.0-1.0	0-1
	14-18	1.0-1.0	7.4-7.8	1-3	---	0.0-2.0	0-1
	18-28	---	---	---	---	---	---

Table 16.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	In	meq/100 g	pH	Pct	Pct	mmhos/cm	
306:							
Kitsili-----	0-7	5.0-10	7.4-8.4	1-3	---	0.0-1.0	0-1
	7-14	5.0-10	7.4-8.4	1-3	---	0.0-1.0	0-1
	14-64	5.0-10	7.9-8.4	3-5	---	0.0-2.0	0-1
Mido-----	0-3	3.0-5.0	7.9-8.4	0-1	---	0.0-1.0	0-1
	3-62	2.0-5.0	7.9-8.4	0-1	---	0.0-1.0	0-1
307:							
Bodot-----	0-3	15-20	7.4-8.4	5-10	---	0.0-2.0	0-5
	3-8	20-25	8.5-9.0	5-10	---	2.0-4.0	5-13
	8-24	20-25	8.5-9.0	1-5	1-3	2.0-8.0	5-13
	24-34	---	---	---	---	---	---
Beclabito-----	0-4	10-15	7.9-8.4	5-10	---	0.0-2.0	0-5
	4-23	15-20	8.5-9.0	10-15	---	0.0-2.0	5-30
	23-32	15-20	8.5-9.0	15-40	---	2.0-4.0	13-30
	32-56	20-25	8.5-9.0	10-15	1-5	2.0-4.0	13-30
	56-66	---	---	---	---	---	---
Rock outcrop-----	0-80	---	---	---	---	---	---
308:							
Mcelmo-----	0-1	10-15	7.4-8.4	5-10	---	0.0-2.0	0-5
	1-14	20-30	8.5-9.0	10-25	0-2	2.0-4.0	13-30
	14-30	15-25	7.9-9.0	15-25	2-5	8.0-16.0	5-13
	30-54	15-25	7.9-8.4	5-10	10-30	8.0-16.0	5-13
	54-64	---	---	---	---	---	---
Farview-----	0-3	5.0-10	7.4-8.4	5-10	---	0.0-2.0	0-1
	3-7	5.0-10	7.9-8.4	15-20	---	2.0-4.0	0-1
	7-11	---	---	---	---	---	---
309:							
Rock outcrop-----	0-80	---	---	---	---	---	---
309:							
Rizno-----	0-4	5.0-15	7.4-7.8	1-3	---	0.0-2.0	0-1
	4-6	5.0-15	7.9-8.4	1-5	---	0.0-2.0	0-1
	6-16	---	---	---	---	---	---
310:							
Millett-----	0-2	5.0-15	7.4-7.8	1-3	---	0.0-1.0	0-1
	2-6	10-20	7.9-8.4	1-3	---	0.0-1.0	0-1
	6-16	10-20	7.9-9.0	15-30	---	0.0-2.0	0-5
	16-31	5.0-10	8.5-9.0	15-40	---	0.0-2.0	5-13
	31-64	5.0-10	7.9-9.0	5-10	---	2.0-4.0	5-13
Blanding-----	0-2	5.0-10	7.4-7.8	0-3	---	0.0-1.0	0-1
	2-9	5.0-10	7.9-8.4	0-3	---	0.0-1.0	0-1
	9-24	10-15	7.9-8.4	3-5	---	0.0-2.0	0-1
	24-63	10-15	7.9-8.4	5-10	---	0.0-2.0	0-1
Strych-----	0-1	5.0-15	7.9-8.4	1-3	---	0.0-2.0	0-1
	1-5	5.0-15	7.9-8.4	5-10	---	0.0-2.0	0-1
	5-42	5.0-15	8.5-9.0	10-30	---	0.0-2.0	0-5
	42-66	5.0-10	8.5-9.0	1-5	---	2.0-4.0	0-5

Table 16.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	In	meq/100 g	pH	Pct	Pct	mmhos/cm	
311:							
Kinusta-----	0-3	5.0-10	7.4-7.8	1-5	---	0.0-1.0	0-1
	3-17	5.0-10	7.9-9.0	5-10	---	0.0-2.0	0-5
	17-27	---	---	---	---	---	---
Eslendo-----	0-3	5.0-15	7.9-8.4	1-3	---	0.0-1.0	0-1
	3-18	10-20	7.9-9.0	1-3	---	0.0-2.0	0-5
	18-28	---	---	---	---	---	---
Rock outcrop-----	0-80	---	---	---	---	---	---
312:							
Blanding-----	0-3	5.0-10	7.4-7.8	0-5	---	0.0-1.0	0-1
	3-9	5.0-10	7.9-8.4	0-5	---	0.0-1.0	0-1
	9-37	10-15	7.9-8.4	5-10	---	0.0-2.0	0-1
	37-66	10-15	7.9-8.4	5-10	---	0.0-2.0	0-1
313:							
Marjane-----	0-2	5.0-10	7.4-8.4	1-5	---	0.0-1.0	0-1
	2-18	5.0-10	7.9-8.4	1-5	---	0.0-1.0	0-1
	18-28	5.0-10	7.9-8.4	5-10	---	0.0-2.0	0-1
	28-38	---	---	---	---	---	---
Kitsili-----	0-10	5.0-10	7.4-8.4	1-3	---	0.0-1.0	0-1
	10-19	5.0-10	7.4-8.4	1-3	---	0.0-1.0	0-1
	19-65	5.0-10	7.9-8.4	3-5	---	0.0-2.0	0-1
314:							
Mido-----	0-7	3.0-5.0	7.9-8.4	0-1	---	0.0-1.0	0-1
	7-62	2.0-5.0	7.9-8.4	0-1	---	0.0-1.0	0-1
315:							
Shoegame-----	0-4	5.0-10	7.4-7.8	3-5	---	0.0-1.0	0-1
	4-19	2.0-5.0	7.4-8.4	5-10	---	0.0-1.0	0-1
	19-65	1.0-1.0	7.4-8.4	3-8	---	0.0-1.0	0-1
Riverwash-----	0-10	0.0-1.0	---	---	---	0.0-2.0	---
	10-80	0.0-1.0	---	---	---	0.0-2.0	---
316:							
Millett-----	0-2	5.0-15	6.6-7.3	1-3	---	0.0-1.0	0-1
	2-14	10-20	7.4-8.4	1-5	---	0.0-1.0	0-1
	14-26	5.0-10	7.9-8.4	15-30	---	0.0-1.0	0-1
	26-63	5.0-10	7.9-9.0	5-10	---	0.0-1.0	---
Strych-----	0-2	5.0-15	7.4-7.8	1-5	---	0.0-2.0	---
	2-16	5.0-10	7.9-9.0	5-10	---	0.0-2.0	0-5
	16-53	5.0-10	7.9-9.0	10-15	---	0.0-2.0	5-13
	53-64	3.0-10	7.9-9.0	5-10	---	0.0-2.0	5-13
Doakum-----	0-3	5.0-10	7.4-7.8	---	---	0.0-1.0	0-1
	3-16	10-15	7.4-7.8	---	---	0.0-2.0	0-1
	16-46	10-15	7.9-8.4	3-5	---	0.0-2.0	0-5
	46-80	5.0-10	7.9-9.0	1-5	---	2.0-4.0	0-5

Table 16.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	In	meq/100 g	pH	Pct	Pct	mmhos/cm	
317:							
Toadlena-----	0-1	10-15	7.9-8.4	5-10	0-1	2.0-4.0	5-13
	1-12	10-20	7.4-8.4	1-10	15-25	2.0-4.0	5-13
	12-18	10-20	7.4-7.8	0-1	5-15	8.0-16.0	5-13
	18-22	---	---	---	---	---	---
Eagleeye-----	0-2	15-20	7.4-8.4	1-5	---	2.0-4.0	0-5
	2-16	20-25	7.4-8.4	0-1	2-5	4.0-16.0	5-13
	16-20	---	---	---	---	---	---
318:							
Camino-----	0-3	15-25	7.4-7.8	1-3	0-1	0.0-2.0	0-5
	3-28	15-30	8.5-9.0	1-5	0-1	0.0-2.0	5-30
	28-52	15-25	7.9-8.4	5-10	2-5	2.0-4.0	13-30
	52-68	10-25	7.9-8.4	1-5	2-5	2.0-4.0	13-30
319:							
Skyhawk-----	0-2	10-15	6.6-7.3	1-5	---	0.0-1.0	0-1
	2-6	10-25	7.4-7.8	5-15	---	0.0-1.0	0-1
	6-23	10-25	8.5-9.0	15-25	---	0.0-2.0	0-5
	23-35	10-20	8.5-9.0	10-15	---	2.0-4.0	0-5
	35-45	---	---	---	---	---	---
Lavellga-----	0-2	5.0-15	7.4-7.8	---	---	0.0-1.0	0-1
	2-13	10-15	7.9-9.0	20-40	---	0.0-1.0	0-5
	13-50	5.0-10	8.5-9.0	50-70	---	0.0-1.0	0-5
	50-65	5.0-10	8.5-9.6	5-15	---	0.0-2.0	0-5
320:							
Beclabito-----	0-7	5.0-10	7.9-8.4	5-10	---	0.0-2.0	0-5
	7-24	5.0-10	8.5-9.0	10-15	---	0.0-2.0	5-13
	24-31	5.0-10	8.5-9.0	15-25	---	4.0-8.0	30-50
	31-37	5.0-10	8.5-9.0	5-10	---	8.0-16.0	50-70
	37-47	---	---	---	---	---	---
Kinusta-----	0-3	5.0-10	7.9-8.4	1-5	---	0.0-1.0	0-1
	3-16	5.0-10	7.9-9.0	5-10	---	0.0-2.0	0-5
	16-20	---	---	---	---	---	---
Badland-----	0-60	---	---	---	---	---	---
400:							
Wetherill-----	0-3	10-15	6.6-7.3	0-1	---	0.0-2.0	0-5
	3-18	10-15	6.6-7.8	0-1	---	0.0-2.0	0-5
	18-42	10-15	7.9-8.4	2-10	---	0.0-2.0	0-5
	42-70	10-15	7.9-9.0	5-30	---	0.0-2.0	0-5
Atlatl-----	0-2	10-15	7.9-8.4	10-15	---	0.0-1.0	0-1
	2-17	10-15	7.9-8.4	15-70	---	0.0-1.0	0-1
	17-30	5.0-10	7.9-8.4	40-90	---	0.0-1.0	0-1
	30-40	---	---	---	---	---	---
401:							
Vessilla-----	0-3	5.0-10	7.4-7.8	3-5	---	0.0-1.0	0-1
	3-8	5.0-10	7.4-8.4	5-20	---	0.0-1.0	0-1
	8-18	---	---	---	---	---	---
Rock outcrop-----	0-80	---	---	---	---	---	---

Table 16.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	In	meq/100 g	pH	Pct	Pct	mmhos/cm	
402:							
Chazner-----	0-2	10-15	6.6-7.8	1-3	---	0.0-1.0	0-1
	2-6	10-15	7.4-8.4	10-15	---	0.0-1.0	0-1
	6-18	10-20	7.4-8.4	30-50	---	0.0-1.0	0-1
	18-29	5.0-10	7.9-8.4	50-70	---	0.0-1.0	0-1
	29-39	---	---	---	---	---	0-1
403:							
Chazner-----	0-2	10-15	6.6-7.8	3-5	---	0.0-1.0	0-1
	2-6	10-15	7.4-8.4	10-15	---	0.0-1.0	0-1
	6-16	10-20	7.4-8.4	30-50	---	0.0-1.0	0-1
	16-25	5.0-10	7.9-8.4	50-70	---	0.0-1.0	0-1
	25-29	---	---	---	---	---	---
Katzine-----	0-7	10-15	6.6-7.8	3-5	---	0.0-1.0	0-1
	7-47	10-15	7.9-8.4	15-25	---	0.0-1.0	0-1
	47-63	5.0-10	7.9-8.4	3-5	---	0.0-1.0	0-1
404:							
Wetherill-----	0-4	10-15	6.6-7.3	0-1	---	0.0-2.0	0-5
	4-19	10-15	6.6-7.8	0-1	---	0.0-2.0	0-5
	19-65	10-15	7.9-8.4	2-10	---	0.0-2.0	0-5
Tsezhin-----	0-2	10-20	6.6-7.3	---	---	0.0-1.0	0-1
	2-35	15-20	6.6-7.8	3-10	---	0.0-1.0	0-1
	35-51	10-20	7.9-8.4	15-35	---	0.0-1.0	0-1
	51-65	10-20	7.9-8.4	3-10	---	0.0-2.0	0-1
406:							
Rock outcrop-----	0-80	---	---	---	---	---	---
Nizhoni-----	0-3	5.0-10	7.4-8.4	1-5	---	0.0-1.0	0-1
	3-7	5.0-10	7.4-8.4	1-5	---	0.0-1.0	0-1
	7-17	---	---	---	---	---	---
407:							
Iwela-----	0-3	10-15	6.6-7.3	---	---	0.0-1.0	0-1
	3-26	10-20	6.6-7.8	---	---	0.0-1.0	0-1
	26-44	5.0-15	7.4-8.4	1-5	---	0.0-1.0	0-1
	44-64	5.0-10	7.9-8.4	1-10	---	0.0-1.0	0-1
Nomrah-----	0-3	5.0-15	6.6-7.3	0-1	---	0.0-1.0	0-1
	3-32	10-20	6.6-7.3	0-3	---	0.0-1.0	0-1
	32-58	10-20	7.9-8.4	15-30	---	0.0-1.0	0-1
	58-62	5.0-10	7.4-7.8	1-5	---	0.0-1.0	0-1
Vosburg-----	0-7	10-20	6.1-6.5	---	---	0.0-1.0	0-1
	7-36	10-25	6.6-7.3	0-1	---	0.0-1.0	0-1
	36-65	10-25	7.4-7.8	1-3	---	0.0-1.0	0-1
408:							
Nizhoni-----	0-3	5.0-10	7.4-8.4	1-5	---	0.0-1.0	0-1
	3-9	5.0-10	7.4-8.4	1-5	---	0.0-1.0	0-1
	9-13	---	---	---	---	---	---
Rock outcrop-----	0-80	---	---	---	---	---	---

Table 16.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	In	meq/100 g	pH	Pct	Pct	mmhos/cm	
409: Chinlini-----	0-3	10-15	7.4-7.8	0-1	---	0.0-1.0	0-1
	3-26	10-20	7.4-8.4	1-5	---	0.0-1.0	0-1
	26-38	10-20	7.9-8.4	5-15	---	0.0-1.0	0-1
	38-50	5.0-10	8.5-9.0	15-30	---	0.0-2.0	0-5
	50-60	---	---	---	---	---	---
410: Wetherill-----	0-3	5.0-15	7.9-8.4	0-1	---	0.0-1.0	0-1
	3-45	10-20	7.9-8.4	1-5	---	0.0-1.0	0-1
	45-66	5.0-15	7.4-8.4	0-1	---	0.0-2.0	0-1
411: Sojourn-----	0-2	5.0-10	7.4-8.4	5-10	---	0.0-1.0	0-1
	2-15	5.0-10	7.9-8.4	5-15	---	0.0-2.0	0-1
	15-25	---	---	---	---	---	---
Badland-----	0-60	---	---	---	---	---	---
412: Highdye-----	0-4	5.0-15	6.1-7.3	---	---	0.0-1.0	0-1
	4-13	15-30	6.6-7.3	0-3	---	0.0-1.0	0-1
	13-23	---	---	---	---	---	---
Menefee-----	0-2	10-20	7.9-8.4	5-10	---	0.0-1.0	0-1
	2-17	10-25	7.9-8.4	5-15	---	0.0-1.0	0-1
	17-27	---	---	---	---	---	---
413: Hozho-----	0-3	5.0-10	7.4-7.8	0-3	---	0.0-1.0	0-1
	3-6	5.0-10	7.4-8.4	0-3	---	0.0-1.0	0-1
	6-14	2.0-5.0	7.4-8.4	0-3	---	0.0-1.0	0-1
	14-24	---	---	---	---	---	---
Quezcan-----	0-3	15-20	7.9-8.4	3-10	---	0.0-1.0	0-1
	3-6	20-25	7.9-9.0	5-10	---	0.0-1.0	0-5
	6-10	20-25	7.9-9.0	5-10	---	0.0-1.0	0-5
	10-27	20-25	7.9-9.0	3-10	0-2	0.0-4.0	0-5
	27-37	---	---	---	---	---	---
Rock outcrop-----	0-80	---	---	---	---	---	---
414: Arabrab-----	0-3	5.0-15	6.6-7.3	---	---	0.0-1.0	0-1
	3-16	10-20	6.6-8.4	0-15	---	0.0-1.0	0-1
	16-20	---	---	---	---	---	---
Wetherill-----	0-3	5.0-15	6.6-7.3	---	---	0.0-1.0	0-1
	3-23	10-20	6.6-7.3	0-1	---	0.0-1.0	0-1
	23-41	10-20	7.9-8.4	5-10	---	0.0-1.0	0-1
	41-52	10-20	7.9-8.4	5-10	---	0.0-1.0	0-1
	52-62	---	---	---	---	---	---
415: Tsezhin-----	0-4	5.0-15	6.6-7.3	0-1	---	0.0-1.0	0-1
	4-25	10-25	7.4-8.4	1-10	---	0.0-1.0	0-1
	25-62	10-25	7.9-8.4	15-35	---	0.0-1.0	0-1

Table 16.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	In	meq/100 g	pH	Pct	Pct	mmhos/cm	
416:							
Arabrab-----	0-2	5.0-15	6.6-7.3	---	---	0.0-1.0	0-1
	2-15	10-20	6.6-8.4	0-15	---	0.0-1.0	0-1
	15-25	---	---	---	---	---	---
Rock outcrop-----	0-80	---	---	---	---	---	---
417:							
Wetherill-----	0-3	10-15	6.6-7.3	0-1	---	0.0-2.0	0-5
	3-25	10-15	6.6-7.8	0-1	---	0.0-2.0	0-5
	25-61	10-15	7.9-8.4	2-10	---	0.0-2.0	0-5
	61-66	10-15	7.9-9.0	5-30	---	0.0-2.0	0-5
418:							
Menefee-----	0-2	10-25	7.9-8.4	3-5	---	0.0-1.0	0-1
	2-18	10-20	7.9-8.4	3-5	---	0.0-1.0	0-1
	18-28	---	---	---	---	---	---
Espiritu-----	0-6	5.0-15	6.6-7.3	---	---	0.0-1.0	0-1
	6-24	10-20	6.6-7.8	0-1	---	0.0-1.0	0-1
	24-42	10-20	7.9-8.4	3-5	---	0.0-1.0	0-1
	42-70	3.0-10	7.9-8.4	3-5	---	0.0-1.0	0-1
Rock outcrop-----	0-80	---	---	---	---	---	---
500:							
Whit-----	0-10	10-15	7.4-7.8	1-3	---	0.0-1.0	0-1
	10-38	10-20	7.9-8.4	5-10	---	0.0-1.0	0-1
	38-65	10-20	7.9-8.4	15-50	---	0.0-2.0	0-1
501:							
Escavada-----	0-5	1.0-1.0	7.4-8.4	1-5	---	0.0-2.0	0-1
	5-70	1.0-1.0	7.4-9.0	1-5	---	4.0-8.0	0-5
Riverwash-----	0-6	0.0-1.0	---	---	---	---	---
	6-60	0.0-1.0	---	---	---	---	---
502:							
Sogzie-----	0-10	5.0-10	7.4-7.8	1-3	---	0.0-1.0	0-1
	10-50	10-15	7.9-8.4	5-10	---	0.0-1.0	0-1
	50-70	10-15	7.9-8.4	5-20	---	0.0-1.0	0-1
503:							
Claysprings-----	0-2	10-15	7.4-7.8	3-5	---	0.0-2.0	---
	2-4	20-30	8.5-9.0	3-5	---	2.0-8.0	13-30
	4-12	20-30	7.9-9.0	1-3	2-5	4.0-16.0	13-30
	12-16	---	---	---	---	---	---
Badland-----	0-60	---	---	---	---	---	---
504:							
Tohona-----	0-1	10-15	7.4-7.8	3-5	---	0.0-2.0	0-5
	1-11	20-30	8.5-9.6	5-10	---	0.0-4.0	13-30
	11-33	15-20	7.4-8.4	2-5	15-30	8.0-16.0	5-13
	33-43	---	---	---	---	---	---

Table 16.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	In	meq/100 g	pH	Pct	Pct	mmhos/cm	
504:							
Kimnoli-----	0-4	5.0-10	7.4-7.8	1-5	---	0.0-1.0	0-1
	4-9	10-15	7.9-8.4	5-10	---	0.0-1.0	0-1
	9-19	---	---	---	---	---	---
Claysprings-----	0-2	10-15	7.4-7.8	3-5	---	0.0-2.0	---
	2-5	20-30	8.5-9.0	3-5	---	2.0-8.0	13-30
	5-16	20-30	7.9-9.0	1-3	2-5	4.0-16.0	13-30
	16-26	---	---	---	---	---	---
505:							
Recapture-----	0-3	5.0-10	7.4-8.4	0-5	---	0.0-2.0	0-5
	3-17	10-15	8.5-9.6	5-10	0-1	0.0-2.0	13-30
	17-39	10-20	8.5-9.6	10-30	5-10	4.0-16.0	30-60
	39-53	5.0-10	8.5-9.6	5-10	5-10	4.0-8.0	13-30
	53-65	5.0-10	8.5-9.6	1-5	1-5	4.0-8.0	5-13
Shorthair-----	0-1	5.0-10	7.9-8.4	1-5	---	0.0-2.0	5-13
	1-5	10-15	9.1-9.6	5-10	---	2.0-4.0	13-30
	5-16	5.0-10	8.5-9.6	5-10	---	4.0-8.0	30-80
	16-26	---	---	---	---	---	---
Aneth-----	0-8	5.0-10	7.4-8.4	1-3	---	0.0-1.0	0-1
	8-28	5.0-10	7.9-8.4	1-3	---	0.0-1.0	0-1
	28-37	10-15	7.9-9.0	2-5	---	0.0-1.0	0-5
	37-65	10-15	7.9-9.0	2-5	---	0.0-1.0	0-5
506:							
Blackston-----	0-9	5.0-15	7.9-8.4	1-5	---	0.0-2.0	0-5
	9-25	10-15	7.9-9.0	15-40	---	0.0-2.0	5-13
	25-49	2.0-5.0	7.9-8.4	1-3	---	4.0-8.0	0-5
	49-66	2.0-5.0	7.9-8.4	1-3	---	4.0-8.0	0-5
Grazane-----	0-2	5.0-10	7.9-8.4	5-10	---	0.0-2.0	0-5
	2-6	5.0-10	7.9-8.4	5-10	---	0.0-2.0	0-5
	6-20	15-20	8.5-9.0	10-15	---	2.0-4.0	5-13
	20-26	15-20	8.5-9.0	5-10	---	4.0-8.0	5-13
	26-36	---	---	---	---	---	---
507:							
Sheppard-----	0-3	2.0-5.0	7.4-7.8	1-3	---	0.0-1.0	0-1
	3-70	2.0-5.0	7.4-8.4	2-5	---	0.0-1.0	0-1
508:							
Shalet-----	0-3	10-20	7.9-8.4	1-3	---	2.0-4.0	0-5
	3-6	10-25	7.9-8.4	1-3	---	4.0-8.0	5-13
	6-15	10-25	8.5-9.0	1-3	0-1	8.0-16.0	13-30
	15-25	---	---	---	---	---	---
Rock outcrop-----	0-80	---	---	---	---	---	---
509:							
Trail-----	0-5	2.0-5.0	7.9-8.4	1-3	---	0.0-1.0	0-1
	5-70	2.0-5.0	7.9-9.0	1-3	---	0.0-2.0	0-5

Table 16.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	In	meq/100 g	pH	Pct	Pct	mmhos/cm	
510: Aneth-----	0-2	5.0-10	7.4-8.4	1-3	---	0.0-1.0	0-1
	2-36	5.0-10	7.9-8.4	1-3	---	---	0-1
	36-65	10-15	7.9-9.0	2-5	---	---	0-1
511: Redlands-----	0-2	5.0-10	7.4-7.8	1-3	---	---	---
	2-13	5.0-10	7.9-8.4	1-3	---	---	---
	13-22	10-15	7.9-8.4	3-5	---	---	0-5
	22-65	10-15	8.5-9.0	5-10	---	2.0-4.0	5-13
512: Gotho-----	0-2	5.0-10	8.5-9.0	1-5	---	0.0-2.0	5-13
	2-13	10-20	8.5-9.0	1-5	---	0.0-2.0	13-30
	13-66	10-20	8.5-9.0	1-5	0-1	4.0-8.0	13-30
513: Sogzie-----	0-4	3.0-5.0	7.9-8.4	1-5	---	0.0-2.0	0-1
	4-14	3.0-5.0	7.9-8.4	5-10	---	0.0-2.0	0-1
	14-36	5.0-10	7.9-9.0	10-25	---	0.0-2.0	0-5
	36-42	2.0-5.0	7.9-9.0	5-10	---	2.0-4.0	0-5
	42-52	---	---	---	---	---	---
Aneth-----	0-7	5.0-10	7.4-8.4	1-3	---	0.0-1.0	0-1
	7-25	5.0-10	7.9-8.4	1-3	---	0.0-1.0	0-1
	25-54	10-15	7.9-9.0	2-5	---	0.0-1.0	0-1
	54-66	10-15	7.9-9.0	2-5	---	0.0-1.0	0-1
514: Aneth-----	0-9	5.0-10	7.4-8.4	1-3	---	0.0-1.0	0-1
	9-33	5.0-10	7.9-8.4	1-3	---	0.0-1.0	0-1
	33-51	10-15	7.9-9.0	2-5	---	0.0-1.0	0-1
	51-70	10-15	7.9-9.0	2-5	---	0.0-1.0	0-1
515: Piute-----	0-3	2.0-5.0	7.9-8.4	1-3	---	0.0-1.0	0-1
	3-7	2.0-5.0	7.9-8.4	1-3	---	0.0-1.0	0-1
	7-17	---	---	---	---	---	---
Bluechief-----	0-5	2.0-5.0	7.4-7.8	0-3	---	0.0-1.0	0-1
	5-11	5.0-10	7.9-8.4	1-5	---	0.0-1.0	0-1
	11-22	5.0-10	8.5-9.0	5-15	---	0.0-1.0	0-5
	22-29	5.0-10	8.5-9.0	15-30	---	0.0-2.0	0-5
	29-39	---	---	---	---	---	---
Rock outcrop-----	0-80	---	---	---	---	---	---
516: Kaito-----	0-3	10-15	7.9-8.4	5-10	---	0.0-1.0	0-1
	3-10	10-15	7.9-8.4	10-25	---	0.0-1.0	0-1
	10-24	10-15	7.9-8.4	25-50	---	0.0-1.0	0-1
	24-47	5.0-10	8.5-9.0	5-25	---	0.0-2.0	0-5
	47-57	---	---	---	---	---	---
Claysprings-----	0-2	10-15	7.4-7.8	3-5	---	0.0-2.0	---
	2-5	20-30	8.5-9.0	3-5	---	2.0-8.0	13-30
	5-16	20-30	7.9-9.0	1-3	2-5	4.0-16.0	13-30
	16-26	---	---	---	---	---	---

Table 16.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	In	meq/100 g	pH	Pct	Pct	mmhos/cm	
517: Moffat-----	0-6	1.0-1.0	7.4-8.4	1-5	---	0.0-1.0	0-1
	6-28	5.0-10	7.9-8.4	5-40	---	0.0-1.0	0-1
	28-47	5.0-10	8.5-9.0	40-60	---	0.0-1.0	0-5
	47-65	5.0-15	8.5-9.0	10-20	---	0.0-2.0	5-13
518: Tohatin-----	0-3	2.0-5.0	7.9-8.4	2-5	---	0.0-1.0	0-1
	3-48	2.0-5.0	7.9-9.0	5-15	---	0.0-1.0	0-5
	48-80	2.0-10	7.9-9.0	5-10	---	0.0-1.0	0-5
Sheppard-----	0-8	2.0-5.0	7.4-7.8	1-3	---	0.0-1.0	0-1
	8-80	2.0-5.0	7.4-8.4	2-5	---	0.0-1.0	0-1
519: Shumbegay-----	0-2	1.0-1.0	7.9-9.0	1-3	---	0.0-2.0	0-13
	2-6	3.0-5.0	8.5-9.0	1-3	---	0.0-2.0	13-30
	6-10	1.0-1.0	8.5-9.0	1-3	---	0.0-2.0	5-30
	10-80	2.0-4.0	8.5-9.0	1-3	---	0.0-2.0	5-30
520: Rock outcrop-----	0-80	---	---	---	---	---	---
Needle-----	0-5	2.0-5.0	7.4-7.8	0-1	---	0.0-1.0	0-1
	5-15	2.0-5.0	7.4-7.8	3-5	---	0.0-1.0	0-1
	15-19	---	---	---	---	---	---
521: Sandbench-----	0-11	2.0-5.0	7.4-8.4	0-3	---	0.0-1.0	0-1
	11-17	2.0-5.0	7.9-8.4	5-10	---	0.0-1.0	0-1
	17-31	2.0-5.0	7.9-8.4	5-20	---	0.0-2.0	0-1
	31-41	---	---	---	---	---	---
Sheppard-----	0-4	1.0-1.0	7.4-7.8	1-3	---	0.0-1.0	0-1
	4-61	2.0-5.0	7.4-8.4	2-5	---	0.0-1.0	0-1
522: Pennell-----	0-5	5.0-10	7.4-8.4	1-5	---	0.0-1.0	0-1
	5-10	5.0-15	7.9-8.4	5-10	---	0.0-1.0	0-1
	10-18	5.0-15	7.9-8.4	15-40	---	0.0-2.0	0-1
	18-22	---	---	---	---	---	---
523: Tyende-----	0-6	2.0-5.0	7.9-8.4	1-3	---	0.0-2.0	0-5
	6-10	5.0-10	8.5-9.6	3-5	---	2.0-8.0	30-40
	10-14	10-15	9.1-9.6	5-10	---	8.0-16.0	30-60
	14-37	5.0-10	8.5-9.0	5-15	0-1	8.0-25.0	30-60
	37-41	---	---	---	---	---	---
Aneth-----	0-2	5.0-10	7.4-8.4	1-3	---	0.0-1.0	0-1
	2-32	5.0-10	7.9-8.4	1-3	---	0.0-1.0	0-1
	32-63	10-15	7.9-9.0	2-5	---	0.0-1.0	0-1
Shumbegay-----	0-1	1.0-1.0	7.9-9.0	1-3	---	0.0-2.0	0-13
	1-5	3.0-5.0	8.5-9.0	1-3	---	0.0-2.0	13-30
	5-80	1.0-1.0	8.5-9.0	1-3	---	0.0-2.0	5-30

Table 16.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	In	meq/100 g	pH	Pct	Pct	mmhos/cm	
524:							
Uzaneva-----	0-1	20-25	7.9-8.4	1-5	---	0.0-2.0	0-5
	1-13	20-35	8.5-9.0	1-5	---	0.0-2.0	5-13
	13-25	20-30	8.5-9.0	1-5	0-2	2.0-4.0	13-30
	25-80	15-20	8.5-9.0	1-5	0-2	2.0-4.0	13-30
525:							
Rock outcrop-----	0-80	---	---	---	---	---	---
526:							
Sandbench-----	0-8	2.0-5.0	7.4-8.4	0-3	---	0.0-1.0	0-1
	8-19	2.0-5.0	7.9-8.4	5-10	---	0.0-1.0	0-1
	19-37	2.0-5.0	7.9-8.4	5-20	---	0.0-2.0	0-1
	37-41	---	---	---	---	---	---
Rock outcrop-----	0-80	---	---	---	---	---	---
Piute, cool-----	0-3	2.0-5.0	7.9-8.4	1-3	---	0.0-1.0	0-1
	3-8	2.0-5.0	7.9-8.4	1-3	---	0.0-1.0	0-1
	8-12	---	---	---	---	---	---
527:							
Outpost-----	0-3	10-25	7.9-8.4	1-3	---	0.0-2.0	0-5
	3-35	15-30	7.9-9.0	1-3	1-5	2.0-8.0	0-5
	35-58	5.0-10	7.4-8.4	1-3	0-1	4.0-8.0	0-5
	58-80	10-15	7.4-8.4	1-3	0-1	4.0-8.0	0-5
528:							
Mack-----	0-3	5.0-10	7.4-7.8	3-5	---	0.0-1.0	0-1
	3-13	10-15	7.9-8.4	5-10	---	0.0-1.0	0-1
	13-51	10-15	7.9-8.4	20-40	---	2.0-4.0	0-1
	51-65	5.0-10	8.5-9.0	5-10	0-1	4.0-8.0	0-5
600:							
Kunz-----	0-4	5.0-15	6.6-7.3	---	---	---	---
	4-23	10-20	6.6-7.3	---	---	---	---
	23-38	5.0-10	6.6-7.3	---	---	---	---
	38-66	5.0-10	6.6-7.3	---	---	---	---
Yahmore-----	0-5	10-15	6.1-7.3	---	---	---	---
	5-33	10-15	6.1-7.3	---	---	---	---
	33-64	10-15	6.6-7.3	---	---	---	---
602:							
Bostwick-----	0-10	5.0-15	6.6-7.3	---	---	---	---
	10-51	10-20	6.6-7.8	---	---	---	---
	51-65	5.0-10	6.6-7.8	---	---	---	---
Canburn-----	0-10	15-25	7.4-7.8	1-5	---	---	---
	10-31	20-25	7.4-7.8	5-10	---	---	---
	31-43	5.0-10	7.9-8.4	5-10	---	---	---
	43-65	5.0-15	7.4-7.8	1-5	---	---	---
604:							
Yahmore-----	0-3	10-15	6.1-7.3	---	---	---	---
	3-35	10-15	6.1-7.3	---	---	---	---
	35-64	10-15	6.6-7.3	---	---	---	---

Table 16.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	In	meq/100 g	pH	Pct	Pct	mmhos/cm	
604: Sandark-----	0-5	5.0-10	6.1-6.5	---	---	---	---
	5-36	3.0-10	6.6-7.3	---	---	---	---
	36-66	2.0-5.0	6.6-7.3	---	---	---	---
606: Narbona-----	0-4	5.0-10	6.6-7.3	---	---	---	---
	4-22	5.0-10	6.6-7.3	---	---	---	---
	22-66	10-20	6.6-7.3	---	---	---	---
Deza-----	0-4	5.0-10	5.6-6.0	---	---	---	---
	4-31	1.0-1.0	6.1-7.3	---	---	---	---
	31-62	1.0-1.0	6.1-7.3	---	---	---	---
608: Narbona-----	0-7	5.0-10	6.6-7.3	---	---	---	---
	7-28	5.0-10	6.6-7.3	---	---	---	---
	28-63	10-20	6.6-7.3	---	---	---	---
Zilditloi-----	0-7	2.0-5.0	6.6-7.8	0	---	0	0
	7-31	1.0-5.0	6.6-7.8	0-1	---	0	0
	31-70	1.0-5.0	6.6-7.8	0-1	---	0	0
610: Kunz-----	0-6	10-15	6.6-7.3	---	---	---	---
	6-26	10-15	6.6-7.8	---	---	---	---
	26-70	10-20	6.6-7.8	---	---	---	---
Xankey-----	0-6	10-20	6.6-7.3	---	---	---	---
	6-30	10-20	6.6-7.3	---	---	---	---
	30-63	5.0-15	6.6-8.4	0-2	---	---	0-1
612: Xankey-----	0-6	10-20	6.6-7.3	---	---	---	---
	6-29	10-20	6.6-7.3	---	---	---	---
	29-64	5.0-15	6.6-8.4	0-2	---	---	0-1
614: Kunz-----	0-2	5.0-15	6.6-7.3	---	---	---	---
	2-6	10-15	6.6-7.3	---	---	---	---
	6-28	10-20	6.6-7.3	---	---	---	---
	28-65	10-15	6.6-7.3	---	---	---	---
Tuntsa-----	0-9	5.0-15	6.6-7.3	---	---	---	---
	9-45	5.0-15	6.6-7.3	---	---	---	---
	45-63	5.0-10	6.6-7.3	---	---	---	---
Yahmore-----	0-9	10-15	6.1-7.3	---	---	---	---
	9-24	10-15	6.1-7.3	---	---	---	---
	24-64	10-15	6.6-7.3	---	---	---	---
616: Ligai-----	0-2	10-20	6.6-7.3	---	---	---	---
	2-7	10-20	6.6-7.3	---	---	---	---
	7-25	10-20	6.6-7.8	0-3	---	---	---
	25-35	---	---	---	---	---	---

Table 16.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	In	meq/100 g	pH	Pct	Pct	mmhos/cm	
616:							
Pastorpeak-----	0-4	10-25	6.1-6.5	---	---	---	---
	4-38	10-20	6.6-7.3	---	---	---	---
	38-64	10-20	7.4-7.8	1-3	---	---	---
	64-80	5.0-10	7.4-8.4	1-3	---	---	---
Rock outcrop-----	0-80	---	---	---	---	---	---
618:							
Zibetod-----	0-2	5.0-15	6.1-7.3	---	---	---	---
	2-14	10-15	6.1-7.3	---	---	---	---
	14-24	---	---	---	---	---	---
Bigpaw-----	0-5	15-20	6.1-7.3	---	---	---	---
	5-48	10-20	6.1-7.3	---	---	---	---
	48-57	10-15	6.1-7.3	---	---	---	---
	57-65	10-15	6.1-7.3	---	---	---	---
700:							
Akhoni-----	0-3	5.0-15	6.1-7.3	---	---	---	---
	3-17	5.0-15	6.1-7.3	---	---	---	---
	17-27	---	---	---	---	---	---
Retaw-----	0-3	40-50	5.6-6.0	---	---	---	---
	3-8	25-45	5.6-6.5	---	---	---	---
	8-13	35-55	5.6-6.5	---	---	---	---
	13-33	10-25	5.6-6.5	---	---	---	---
	33-70	5.0-15	5.6-6.5	---	---	---	---
702:							
Bikeyah-----	0-5	10-15	6.1-7.3	---	---	---	---
	5-14	10-15	6.1-7.3	---	---	---	---
	14-29	10-15	6.1-7.3	---	---	---	---
	29-65	5.0-15	6.1-7.3	---	---	---	---
Berland-----	0-2	10-20	5.6-6.5	---	---	---	---
	2-9	15-25	6.1-7.3	---	---	---	---
	9-19	---	---	---	---	---	---
704:							
Klizhin-----	0-4	5.0-15	6.1-7.3	---	---	---	---
	4-49	5.0-15	6.1-7.3	---	---	---	---
	49-56	5.0-10	6.1-7.3	---	---	---	---
	56-64	5.0-10	6.1-7.3	---	---	---	---
Captom-----	0-8	5.0-10	6.1-7.3	---	---	---	---
	8-13	5.0-10	6.1-7.3	---	---	---	---
	13-32	5.0-10	6.1-7.3	---	---	---	---
	32-43	10-15	6.1-7.3	---	---	---	---
	43-58	5.0-10	6.1-7.3	---	---	---	---
	58-68	---	---	---	---	---	---
706:							
Todacheene-----	0-2	10-20	6.1-6.5	---	---	---	---
	2-18	10-25	6.1-7.3	---	---	---	---
	18-37	10-20	6.6-7.3	---	---	---	---
	37-80	5.0-15	6.6-7.3	---	---	---	---

Table 16.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	In	meq/100 g	pH	Pct	Pct	mmhos/cm	
706:							
Viewpoint-----	0-3	15-20	6.1-7.3	---	---	---	---
	3-7	15-20	6.6-7.3	---	---	---	---
	7-17	15-20	6.6-7.3	---	---	---	---
	17-27	---	---	---	---	---	---
Owlspring-----	0-5	10-20	6.1-6.5	---	---	---	---
	5-25	15-30	6.1-7.3	---	---	---	---
	25-43	15-20	6.6-7.3	---	---	---	---
	43-66	10-15	6.6-7.3	---	---	---	---
	66-72	5.0-10	6.6-7.3	---	---	---	---
	72-81	5.0-10	6.6-7.3	---	---	---	---
Tunitcha-----	0-5	10-15	6.6-7.3	---	---	---	---
	5-8	10-15	6.6-7.3	---	---	---	---
	8-38	10-15	6.1-7.3	---	---	---	---
	38-57	5.0-10	6.1-7.3	---	---	---	---
	57-67	---	---	---	---	---	---
708:							
Bangston-----	0-7	5.0-10	6.6-7.3	---	---	---	---
	7-26	5.0-10	6.6-7.3	---	---	---	---
	26-43	5.0-10	6.6-7.3	---	---	---	---
	43-66	2.0-5.0	6.6-7.3	---	---	---	---
710:							
Akhoni-----	0-2	5.0-15	6.1-7.3	---	---	---	---
	2-13	5.0-15	6.1-7.3	---	---	---	---
	13-17	---	---	---	---	---	---
Klizhin-----	0-7	5.0-15	6.1-7.3	---	---	---	---
	7-22	5.0-15	6.1-7.3	---	---	---	---
	22-45	5.0-15	6.1-7.3	---	---	---	---
	45-55	---	---	---	---	---	---
712:							
Sonsela-----	0-4	10-20	6.1-7.3	---	---	---	---
	4-9	5.0-15	6.1-7.3	---	---	---	---
	9-26	10-20	6.1-7.3	---	---	---	---
	26-48	10-20	6.1-7.3	---	---	---	---
	48-70	10-20	6.6-7.3	0-2	---	---	---
Washpass-----	0-12	10-15	5.6-6.0	---	---	---	---
	12-36	5.0-10	6.1-6.5	---	---	---	---
	36-57	5.0-10	6.1-7.3	---	---	---	---
	57-85	5.0-10	6.1-7.3	---	---	---	---
Viewpoint-----	0-3	15-20	6.1-7.3	---	---	---	---
	3-9	15-20	6.6-7.3	---	---	---	---
	9-14	15-20	6.6-7.3	---	---	---	---
	14-18	---	---	---	---	---	---
W:							
Water-----	---	---	---	---	---	---	---

Table 17.--Water Features

(Depths of layers are in feet. See text for definitions of terms used in this table. Absence of an entry indicates that the feature is not a concern or that data were not estimated.)

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			Ft	Ft	Ft				
100: Werito-----	C	Jan-Dec	---	---	---	---	---	---	---
102: Blackston-----	B	Jan-Dec	---	---	---	---	---	---	---
Camac-----	C	Jan-Dec	---	---	---	---	---	---	---
Rock outcrop-----	D	Jan-Dec	---	---	---	---	---	---	---
105: Hamburn-----	B	July	---	---	---	---	---	Very brief	Frequent
		August	---	---	---	---	---	Very brief	Frequent
		September	---	---	---	---	---	Very brief	Frequent
107: Tocito-----	B	March	---	---	---	---	---	Very brief	Rare
		April	---	---	---	---	---	Very brief	Rare
		May	---	---	---	---	---	Very brief	Rare
		June	---	---	---	---	---	Very brief	Rare
		July	---	---	---	---	---	Very brief	Rare
		August	---	---	---	---	---	Very brief	Rare
Gullied land-----	D	Jan-Dec	---	---	---	---	---	---	---
110: Brimhall-----	B	Jan-Dec	---	---	---	---	---	---	---
Benally-----	C	Jan-Dec	---	---	---	---	---	---	---
Genats-----	D	Jan-Dec	---	---	---	---	---	---	---
113: Gyptur-----	B	Jan-Dec	---	---	---	---	---	---	---
115: Denazar-----	A	Jan-Dec	---	---	---	---	---	---	---
Farb-----	D	Jan-Dec	---	---	---	---	---	---	---

Table 17.--Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			Ft	Ft	Ft				
117: Badland-----	D	Jan-Dec	---	---	---	---	---	---	---
Rock outcrop-----	D	Jan-Dec	---	---	---	---	---	---	---
120: Nageezi-----	B	Jan-Dec	---	---	---	---	---	---	---
Denazar-----	A	Jan-Dec	---	---	---	---	---	---	---
122: Blueflat-----	C	Jan-Dec	---	---	---	---	---	---	---
Notal-----	D	March	---	---	---	---	---	Very brief	Rare
		April	---	---	---	---	---	Very brief	Rare
		May	---	---	---	---	---	Very brief	Rare
		June	---	---	---	---	---	Very brief	Rare
		July	---	---	---	---	---	Very brief	Rare
		August	---	---	---	---	---	Very brief	Rare
125: Kimbeto-----	B	Jan-Dec	---	---	---	---	---	---	---
130: Badland-----	D	Jan-Dec	---	---	---	---	---	---	---
Genats-----	D								
133: Razito-----	A	Jan-Dec	---	---	---	---	---	---	---
135: Farb-----	D	Jan-Dec	---	---	---	---	---	---	---
Rock outcrop-----	D	Jan-Dec	---	---	---	---	---	---	---
Badland-----	D	Jan-Dec	---	---	---	---	---	---	---
137: Persayo-----	D	Jan-Dec	---	---	---	---	---	---	---

Table 17.--Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			Ft	Ft	Ft				
137: Cairn-----	B	Jan-Dec	---	---	---	---	---	---	---
Patel-----	C	Jan-Dec	---	---	---	---	---	---	---
140: Benally-----	C	March	---	---	---	---	---	Very brief	Rare
		April	---	---	---	---	---	Very brief	Rare
		May	---	---	---	---	---	Very brief	Rare
		June	---	---	---	---	---	Very brief	Rare
		July	---	---	---	---	---	Very brief	Rare
		August	---	---	---	---	---	Very brief	Rare
142: Bebevar-----	B	May	3.5-5.0	>6.0	---	---	---	---	---
		June	3.5-5.0	>6.0	---	---	---	Very brief	Occasional
		July	3.5-5.0	>6.0	---	---	---	Very brief	Occasional
		August	3.5-5.0	>6.0	---	---	---	Very brief	Occasional
		September	3.5-5.0	>6.0	---	---	---	Very brief	Occasional
		October	3.5-5.0	>6.0	---	---	---	---	---
Walrees-----	C	January	2.0-3.5	>6.0	---	---	---	---	---
		February	2.0-3.5	>6.0	---	---	---	---	---
		March	2.0-3.5	>6.0	---	---	---	---	---
		April	2.0-3.5	>6.0	---	---	---	---	---
		May	2.0-3.5	>6.0	---	---	---	---	---
		June	2.0-3.5	>6.0	---	---	---	Brief	Frequent
		July	2.0-3.5	>6.0	---	---	---	Brief	Frequent
		August	2.0-3.5	>6.0	---	---	---	Brief	Frequent
		September	2.0-3.5	>6.0	---	---	---	Brief	Frequent
		October	2.0-3.5	>6.0	---	---	---	---	---
		November	2.0-3.5	>6.0	---	---	---	---	---
		December	2.0-3.5	>6.0	---	---	---	---	---
145: Razito-----	A	Jan-Dec	---	---	---	---	---	---	---
Huerfano-----	D	Jan-Dec	---	---	---	---	---	---	---

Table 17.--Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			Ft	Ft	Ft				
147: Escavada-----	B	January	5.0-6.0	>6.0	---	---	---	---	---
		February	5.0-6.0	>6.0	---	---	---	---	---
		March	5.0-6.0	>6.0	---	---	---	Very brief	Rare
		April	5.0-6.0	>6.0	---	---	---	Very brief	Rare
		May	5.0-6.0	>6.0	---	---	---	Very brief	Rare
		June	5.0-6.0	>6.0	---	---	---	Very brief	Rare
		July	---	---	---	---	---	Very brief	Rare
		August	---	---	---	---	---	Very brief	Rare
		November	5.0-6.0	>6.0	---	---	---	---	---
		December	5.0-6.0	>6.0	---	---	---	---	---
150: Chipeta-----	D	Jan-Dec	---	---	---	---	---	---	---
Badland-----	D	Jan-Dec	---	---	---	---	---	---	---
Moncisco-----	A	Jan-Dec	---	---	---	---	---	---	---
153: Green River-----	B	January	3.5-5.0	>6.0	---	---	---	---	---
		February	3.5-5.0	>6.0	---	---	---	---	---
		March	3.5-5.0	>6.0	---	---	---	Very brief	Rare
		April	3.5-5.0	>6.0	---	---	---	Very brief	Rare
		May	3.5-5.0	>6.0	---	---	---	Very brief	Rare
		June	3.5-5.0	>6.0	---	---	---	Very brief	Rare
		July	3.5-5.0	>6.0	---	---	---	Very brief	Rare
		August	3.5-5.0	>6.0	---	---	---	Very brief	Rare
		September	3.5-5.0	>6.0	---	---	---	---	---
		October	3.5-5.0	>6.0	---	---	---	---	---
		November	3.5-5.0	>6.0	---	---	---	---	---
		December	3.5-5.0	>6.0	---	---	---	---	---
Green River, saline-----	B	January	3.5-5.0	>6.0	---	---	---	---	---
		February	3.5-5.0	>6.0	---	---	---	---	---
		March	3.5-5.0	>6.0	---	---	---	Very brief	Rare
		April	3.5-5.0	>6.0	---	---	---	Very brief	Rare
		May	3.5-5.0	>6.0	---	---	---	Very brief	Rare
		June	3.5-5.0	>6.0	---	---	---	Very brief	Rare
		July	3.5-5.0	>6.0	---	---	---	Very brief	Rare
		August	3.5-5.0	>6.0	---	---	---	Very brief	Rare
		September	3.5-5.0	>6.0	---	---	---	---	---
		October	3.5-5.0	>6.0	---	---	---	---	---
		November	3.5-5.0	>6.0	---	---	---	---	---
		December	3.5-5.0	>6.0	---	---	---	---	---
155: Mesa-----	B	Jan-Dec	---	---	---	---	---	---	---

Table 17.--Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			Ft	Ft	Ft				
157: Werjo, saline-----	B	March	---	---	---	---	---	Very brief	Rare
		April	---	---	---	---	---	Very brief	Rare
		May	3.5-5.0	>6.0	---	---	---	Very brief	Rare
		June	3.5-5.0	>6.0	---	---	---	Very brief	Rare
		July	3.5-5.0	>6.0	---	---	---	Very brief	Rare
		August	3.5-5.0	>6.0	---	---	---	Very brief	Rare
		September	3.5-5.0	>6.0	---	---	---	---	---
		October	3.5-5.0	>6.0	---	---	---	---	---
Werjo-----	B	March	---	---	---	---	---	Very brief	Rare
		April	---	---	---	---	---	Very brief	Rare
		May	3.5-5.0	>6.0	---	---	---	Very brief	Rare
		June	3.5-5.0	>6.0	---	---	---	Very brief	Rare
		July	3.5-5.0	>6.0	---	---	---	Very brief	Rare
		August	3.5-5.0	>6.0	---	---	---	Very brief	Rare
		September	3.5-5.0	>6.0	---	---	---	---	---
		October	3.5-5.0	>6.0	---	---	---	---	---
160: Notal-----	D	March	---	---	---	---	---	Very brief	Rare
		April	---	---	---	---	---	Very brief	Rare
		May	---	---	---	---	---	Very brief	Rare
		June	---	---	---	---	---	Very brief	Rare
		July	---	---	---	---	---	Very brief	Rare
		August	---	---	---	---	---	Very brief	Rare
Escavada-----	B	January	5.0-6.0	>6.0	---	---	---	---	---
		February	5.0-6.0	>6.0	---	---	---	---	---
		March	5.0-6.0	>6.0	---	---	---	---	---
		April	5.0-6.0	>6.0	---	---	---	---	---
		May	5.0-6.0	>6.0	---	---	---	---	---
		June	5.0-6.0	>6.0	---	---	---	---	---
		July	---	---	---	---	---	Very brief	Occasional
		August	---	---	---	---	---	Very brief	Occasional
		September	---	---	---	---	---	Very brief	Occasional
		November	5.0-6.0	>6.0	---	---	---	---	---
		December	5.0-6.0	>6.0	---	---	---	---	---
Riverwash-----	D	January	0.0-2.0	>6.0	---	---	---	Very long	Frequent
		February	0.0-2.0	>6.0	---	---	---	Very long	Frequent
		March	0.0-2.0	>6.0	---	---	---	Very long	Frequent
		April	0.0-2.0	>6.0	---	---	---	Very long	Frequent
		May	0.0-2.0	>6.0	---	---	---	Very long	Frequent
		June	0.0-2.0	>6.0	---	---	---	Very long	Frequent
		July	0.0-2.0	>6.0	---	---	---	Very long	Frequent
		August	0.0-2.0	>6.0	---	---	---	---	---
		September	0.0-2.0	>6.0	---	---	---	---	---
		October	0.0-2.0	>6.0	---	---	---	Very long	Frequent
		November	0.0-2.0	>6.0	---	---	---	Very long	Frequent
		December	0.0-2.0	>6.0	---	---	---	Very long	Frequent

Table 17.--Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			Ft	Ft	Ft				
163: Werlog-----	C	March	---	---	---	---	---	Very brief	Rare
		April	---	---	---	---	---	Very brief	Rare
		May	2.0-3.5	>6.0	---	---	---	Very brief	Rare
		June	2.0-3.5	>6.0	---	---	---	Very brief	Rare
		July	2.0-3.5	>6.0	---	---	---	Very brief	Rare
		August	2.0-3.5	>6.0	---	---	---	Very brief	Rare
		September	2.0-3.5	>6.0	---	---	---	---	---
		October	2.0-3.5	>6.0	---	---	---	---	---
165: Jeddito-----	B	March	---	---	---	---	---	Very brief	Rare
		April	---	---	---	---	---	Very brief	Rare
		May	---	---	---	---	---	Very brief	Rare
		June	---	---	---	---	---	Very brief	Rare
		July	---	---	---	---	---	Very brief	Rare
		August	---	---	---	---	---	Very brief	Rare
Escavada-----	B	January	5.0-6.0	>6.0	---	---	---	---	---
		February	5.0-6.0	>6.0	---	---	---	---	---
		March	5.0-6.0	>6.0	---	---	---	---	---
		April	5.0-6.0	>6.0	---	---	---	---	---
		May	5.0-6.0	>6.0	---	---	---	---	---
		June	5.0-6.0	>6.0	---	---	---	---	---
		July	---	---	---	---	---	Very brief	Occasional
		August	---	---	---	---	---	Very brief	Occasional
		September	---	---	---	---	---	Very brief	Occasional
		November	5.0-6.0	>6.0	---	---	---	---	---
		December	5.0-6.0	>6.0	---	---	---	---	---
167: Hoskay-----	C	Jan-Dec	---	---	---	---	---	---	---
Patel-----	C	Jan-Dec	---	---	---	---	---	---	---
Badland-----	D	Jan-Dec	---	---	---	---	---	---	---
170: Notal-----	D	March	---	---	---	---	---	Very brief	Rare
		April	---	---	---	---	---	Very brief	Rare
		May	---	---	---	---	---	Very brief	Rare
		June	---	---	---	---	---	Very brief	Rare
		July	---	---	---	---	---	Very brief	Rare
		August	---	---	---	---	---	Very brief	Rare
173: Shiprock-----	B	Jan-Dec	---	---	---	---	---	---	---

Table 17.--Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			Ft	Ft	Ft				
175: Suwanee-----	B	July	---	---	---	---	---	Very brief	Occasional
		August	---	---	---	---	---	Very brief	Occasional
		September	---	---	---	---	---	Very brief	Occasional
177: Notal-----	D	Jan-Dec	---	---	---	---	---	---	---
180: Kimbeto-----	B	Jan-Dec	---	---	---	---	---	---	---
Huerfano-----	D	Jan-Dec	---	---	---	---	---	---	---
183: Gyptur-----	B	Jan-Dec	---	---	---	---	---	---	---
190: Jeddito-----	B	March	---	---	---	---	---	Very brief	Rare
		April	---	---	---	---	---	Very brief	Rare
		May	---	---	---	---	---	Very brief	Rare
		June	---	---	---	---	---	Very brief	Rare
		July	---	---	---	---	---	Very brief	Rare
		August	---	---	---	---	---	Very brief	Rare
195: Tewa-----	B	Jan-Dec	---	---	---	---	---	---	---
200: Tocito-----	B	Jan-Dec	---	---	---	---	---	---	---
205: Shiprock-----	B	Jan-Dec	---	---	---	---	---	---	---
Farb-----	D	Jan-Dec	---	---	---	---	---	---	---
210: Mack-----	C	Jan-Dec	---	---	---	---	---	---	---
Mesa-----	B	Jan-Dec	---	---	---	---	---	---	---
215: Persayo-----	D	Jan-Dec	---	---	---	---	---	---	---

Table 17.--Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			Ft	Ft	Ft				
215: Fordbutte-----	B	Jan-Dec	---	---	---	---	---	---	---
220: Chinde-----	C	Jan-Dec	---	---	---	---	---	---	---
230: Ravola-----	B	July	---	---	---	---	---	Very brief	Occasional
		August	---	---	---	---	---	Very brief	Occasional
		September	---	---	---	---	---	Very brief	Occasional
235: Wingrock-----	B	Jan-Dec	---	---	---	---	---	---	---
Rock outcrop-----	D	Jan-Dec	---	---	---	---	---	---	---
240: Nageezi-----	B	Jan-Dec	---	---	---	---	---	---	---
245: Tsebitai-----	B	Jan-Dec	---	---	---	---	---	---	---
250: Littlehat-----	B	Jan-Dec	---	---	---	---	---	---	---
Persayo-----	D	Jan-Dec	---	---	---	---	---	---	---
Nataani-----	B	Jan-Dec	---	---	---	---	---	---	---
255: Benally-----	C	Jan-Dec	---	---	---	---	---	---	---
260: Littlehat-----	B	Jan-Dec	---	---	---	---	---	---	---
Persayo-----	D	Jan-Dec	---	---	---	---	---	---	---
Badland-----	D	Jan-Dec	---	---	---	---	---	---	---
265: Camac-----	C	Jan-Dec	---	---	---	---	---	---	---

Table 17.--Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			Ft	Ft	Ft				
265: Kimbeto-----	B	Jan-Dec	---	---	---	---	---	---	---
Badland-----	D	Jan-Dec	---	---	---	---	---	---	---
270: Fruitland-----	B	Jan-Dec	---	---	---	---	---	---	---
275: Razito-----	A	Jan-Dec	---	---	---	---	---	---	---
285: Water-----	---	January	---	---	---	---	---	---	---
		February	---	---	---	---	---	---	---
		March	---	---	---	---	---	---	---
		April	---	---	---	---	---	---	---
		May	---	---	---	---	---	---	---
		June	---	---	---	---	---	---	---
		July	---	---	---	---	---	---	---
		August	---	---	---	---	---	---	---
		September	---	---	---	---	---	---	---
		October	---	---	---	---	---	---	---
		November	---	---	---	---	---	---	---
		December	---	---	---	---	---	---	---
		Jan-Dec	---	---	---	---	---	---	---
Riverwash-----	D	January	0.0-2.0	>6.0	---	---	---	Very long	Frequent
		February	0.0-2.0	>6.0	---	---	---	Very long	Frequent
		March	0.0-2.0	>6.0	---	---	---	Very long	Frequent
		April	0.0-2.0	>6.0	---	---	---	Very long	Frequent
		May	0.0-2.0	>6.0	---	---	---	Very long	Frequent
		June	0.0-2.0	>6.0	---	---	---	Very long	Frequent
		July	0.0-2.0	>6.0	---	---	---	Very long	Frequent
		August	0.0-2.0	>6.0	---	---	---	---	---
		September	0.0-2.0	>6.0	---	---	---	---	---
		October	0.0-2.0	>6.0	---	---	---	Very long	Frequent
		November	0.0-2.0	>6.0	---	---	---	Very long	Frequent
		December	0.0-2.0	>6.0	---	---	---	Very long	Frequent
290: Mesa-----	B	May	3.5-6.0	>6.0	---	---	---	---	---
		June	3.5-6.0	>6.0	---	---	---	---	---
		July	3.5-6.0	>6.0	---	---	---	---	---
		August	3.5-6.0	>6.0	---	---	---	---	---
		September	3.5-6.0	>6.0	---	---	---	---	---
		October	3.5-6.0	>6.0	---	---	---	---	---

Table 17.--Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			Ft	Ft	Ft				
295: Mesa-----	B	May	3.5-6.0	>6.0	---	---	---	---	---
		June	3.5-6.0	>6.0	---	---	---	---	---
		July	3.5-6.0	>6.0	---	---	---	---	---
		August	3.5-6.0	>6.0	---	---	---	---	---
		September	3.5-6.0	>6.0	---	---	---	---	---
		October	3.5-6.0	>6.0	---	---	---	---	---
300: Farview-----	D	Jan-Dec	---	---	---	---	---	---	---
Rock outcrop-----	D	Jan-Dec	---	---	---	---	---	---	---
301: Farview-----	D	Jan-Dec	---	---	---	---	---	---	---
Sanostee-----	C	Jan-Dec	---	---	---	---	---	---	---
Rock outcrop-----	D	Jan-Dec	---	---	---	---	---	---	---
302: Doakum-----	B	Jan-Dec	---	---	---	---	---	---	---
303: Snapill-----	B	Jan-Dec	---	---	---	---	---	---	---
304: Farview-----	D	Jan-Dec	---	---	---	---	---	---	---
Beclabito-----	C	Jan-Dec	---	---	---	---	---	---	---
Rock outcrop-----	D	Jan-Dec	---	---	---	---	---	---	---
305: Strych-----	B	Jan-Dec	---	---	---	---	---	---	---
Eagleeye-----	D	Jan-Dec	---	---	---	---	---	---	---
Rock outcrop-----	D	Jan-Dec	---	---	---	---	---	---	---
306: Arches-----	D	Jan-Dec	---	---	---	---	---	---	---

Table 17.--Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			Ft	Ft	Ft				
306: Kitsili-----	B	Jan-Dec	---	---	---	---	---	---	---
Mido-----	A	Jan-Dec	---	---	---	---	---	---	---
307: Bodot-----	C	Jan-Dec	---	---	---	---	---	---	---
Beclabito-----	C	Jan-Dec	---	---	---	---	---	---	---
Rock outcrop-----	D	Jan-Dec	---	---	---	---	---	---	---
308: Mcelmo-----	D	Jan-Dec	---	---	---	---	---	---	---
Farview-----	D	Jan-Dec	---	---	---	---	---	---	---
309: Rock outcrop-----	D	Jan-Dec	---	---	---	---	---	---	---
Rizno-----	D	Jan-Dec	---	---	---	---	---	---	---
310: Millett-----	B	Jan-Dec	---	---	---	---	---	---	---
Blanding-----	B	Jan-Dec	---	---	---	---	---	---	---
Strych-----	B	Jan-Dec	---	---	---	---	---	---	---
311: Kinusta-----	D	Jan-Dec	---	---	---	---	---	---	---
Eslendo-----	D								
Rock outcrop-----	D	Jan-Dec	---	---	---	---	---	---	---
312: Blanding-----	B	Jan-Dec	---	---	---	---	---	---	---
313: Marjane-----	C	Jan-Dec	---	---	---	---	---	---	---

Table 17.--Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			Ft	Ft	Ft				
313: Kitsili-----	B	Jan-Dec	---	---	---	---	---	---	---
314: Mido-----	A	Jan-Dec	---	---	---	---	---	---	---
315: Shoegame-----	B	March	---	---	---	---	---	Very brief	Rare
		April	---	---	---	---	---	Very brief	Rare
		May	---	---	---	---	---	Very brief	Rare
		June	---	---	---	---	---	Very brief	Rare
		July	---	---	---	---	---	Very brief	Rare
		August	---	---	---	---	---	Very brief	Rare
Riverwash-----	A	July	---	---	---	---	---	Very brief	Frequent
		August	---	---	---	---	---	Very brief	Frequent
		September	---	---	---	---	---	Very brief	Frequent
316: Millett-----	B	Jan-Dec	---	---	---	---	---	---	---
Strych-----	B	Jan-Dec	---	---	---	---	---	---	---
Doakum-----	B	Jan-Dec	---	---	---	---	---	---	---
317: Toadlena-----	D	Jan-Dec	---	---	---	---	---	---	---
Eagleeye-----	D	Jan-Dec	---	---	---	---	---	---	---
318: Camino-----	C	Jan-Dec	---	---	---	---	---	---	---
319: Skyhawk-----	C	Jan-Dec	---	---	---	---	---	---	---
Lavellga-----	B	Jan-Dec	---	---	---	---	---	---	---
320: Beclabito-----	C	Jan-Dec	---	---	---	---	---	---	---
Kinusta-----	D	Jan-Dec	---	---	---	---	---	---	---

Table 17.--Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			Ft	Ft	Ft				
320: Badland-----	D	Jan-Dec	---	---	---	---	---	---	---
400: Wetherill-----	B	Jan-Dec	---	---	---	---	---	---	---
Atlatl-----	C	Jan-Dec	---	---	---	---	---	---	---
401: Vessilla-----	D	Jan-Dec	---	---	---	---	---	---	---
Rock outcrop-----	D	Jan-Dec	---	---	---	---	---	---	---
402: Chazner-----	C	Jan-Dec	---	---	---	---	---	---	---
403: Chazner-----	C	Jan-Dec	---	---	---	---	---	---	---
Katzine-----	B	Jan-Dec	---	---	---	---	---	---	---
404: Wetherill-----	B	Jan-Dec	---	---	---	---	---	---	---
Tsezhin-----	B	Jan-Dec	---	---	---	---	---	---	---
406: Rock outcrop-----	D	Jan-Dec	---	---	---	---	---	---	---
Nizhoni-----	D	Jan-Dec	---	---	---	---	---	---	---
407: Iwela-----	B	Jan-Dec	---	---	---	---	---	---	---
Nomrah-----	B	Jan-Dec	---	---	---	---	---	---	---
Vosburg-----	B	Jan-Dec	---	---	---	---	---	---	---
408: Nizhoni-----	D	Jan-Dec	---	---	---	---	---	---	---

Table 17.--Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			Ft	Ft	Ft				
408: Rock outcrop-----	D	Jan-Dec	---	---	---	---	---	---	---
409: Chinlini-----	B	Jan-Dec	---	---	---	---	---	---	---
410: Wetherill-----	B	Jan-Dec	---	---	---	---	---	---	---
411: Sojourn-----	D	Jan-Dec	---	---	---	---	---	---	---
Badland-----	D	Jan-Dec	---	---	---	---	---	---	---
412: Highdye-----	D	Jan-Dec	---	---	---	---	---	---	---
Menefee-----	D	Jan-Dec	---	---	---	---	---	---	---
413: Hozho-----	D	Jan-Dec	---	---	---	---	---	---	---
Quezcan-----	C	Jan-Dec	---	---	---	---	---	---	---
Rock outcrop-----	D	Jan-Dec	---	---	---	---	---	---	---
414: Arabrab-----	D	Jan-Dec	---	---	---	---	---	---	---
Wetherill-----	B	Jan-Dec	---	---	---	---	---	---	---
415: Tsezhin-----	B	Jan-Dec	---	---	---	---	---	---	---
416: Arabrab-----	D	Jan-Dec	---	---	---	---	---	---	---
Rock outcrop-----	D	Jan-Dec	---	---	---	---	---	---	---
417: Wetherill-----	B	Jan-Dec	---	---	---	---	---	---	---

Table 17.--Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			Ft	Ft	Ft				
418: Menefee-----	D	Jan-Dec	---	---	---	---	---	---	---
Espiritu-----	B	Jan-Dec	---	---	---	---	---	---	---
Rock outcrop-----	D	Jan-Dec	---	---	---	---	---	---	---
500: Whit-----	B	Jan-Dec	---	---	---	---	---	---	---
501: Escavada-----	B	January	5.0-6.0	>6.0	---	---	---	---	---
		February	5.0-6.0	>6.0	---	---	---	---	---
		March	5.0-6.0	>6.0	---	---	---	---	---
		April	5.0-6.0	>6.0	---	---	---	---	---
		May	5.0-6.0	>6.0	---	---	---	---	---
		June	5.0-6.0	>6.0	---	---	---	---	---
		July	---	---	---	---	---	Very brief	Occasional
		August	---	---	---	---	---	Very brief	Occasional
		September	---	---	---	---	---	Very brief	Occasional
		November	5.0-6.0	>6.0	---	---	---	---	---
		December	5.0-6.0	>6.0	---	---	---	---	---
Riverwash-----	D	January	0.0-2.0	>6.0	---	---	---	Very long	Frequent
		February	0.0-2.0	>6.0	---	---	---	Very long	Frequent
		March	0.0-2.0	>6.0	---	---	---	Very long	Frequent
		April	0.0-2.0	>6.0	---	---	---	Very long	Frequent
		May	0.0-2.0	>6.0	---	---	---	Very long	Frequent
		June	0.0-2.0	>6.0	---	---	---	Very long	Frequent
		July	0.0-2.0	>6.0	---	---	---	Very long	Frequent
		August	0.0-2.0	>6.0	---	---	---	---	---
		September	0.0-2.0	>6.0	---	---	---	---	---
		October	0.0-2.0	>6.0	---	---	---	Very long	Frequent
		November	0.0-2.0	>6.0	---	---	---	Very long	Frequent
		December	0.0-2.0	>6.0	---	---	---	Very long	Frequent
502: Sogzie-----	B	Jan-Dec	---	---	---	---	---	---	---
503: Claysprings-----	D	Jan-Dec	---	---	---	---	---	---	---
Badland-----	D	Jan-Dec	---	---	---	---	---	---	---
504: Tohona-----	C	Jan-Dec	---	---	---	---	---	---	---

Table 17.--Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			Ft	Ft	Ft				
504: Kinnoli-----	D	Jan-Dec	---	---	---	---	---	---	---
Claysprings-----	D	Jan-Dec	---	---	---	---	---	---	---
505: Recapture-----	B	Jan-Dec	---	---	---	---	---	---	---
Shorthair-----	D	Jan-Dec	---	---	---	---	---	---	---
Aneth-----	B	Jan-Dec	---	---	---	---	---	---	---
506: Blackston-----	B	Jan-Dec	---	---	---	---	---	---	---
Grazane-----	C	Jan-Dec	---	---	---	---	---	---	---
507: Sheppard-----	A	Jan-Dec	---	---	---	---	---	---	---
508: Shalet-----	D	Jan-Dec	---	---	---	---	---	---	---
Rock outcrop-----	D	Jan-Dec	---	---	---	---	---	---	---
509: Trail-----	B	July August September	---	---	---	---	---	Very brief Very brief Very brief	Occasional Occasional Occasional
510: Aneth-----	B	Jan-Dec	---	---	---	---	---	---	---
511: Redlands-----	B	Jan-Dec	---	---	---	---	---	---	---
512: Gotho-----	B	March April May June July August	---	---	---	---	---	Very brief Very brief Very brief Very brief Very brief Very brief	Rare Rare Rare Rare Rare Rare

Table 17.--Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			Ft	Ft	Ft				
513: Sogzie-----	B	Jan-Dec	---	---	---	---	---	---	---
Aneth-----	B	Jan-Dec	---	---	---	---	---	---	---
514: Aneth-----	B	Jan-Dec	---	---	---	---	---	---	---
515: Piute-----	D	Jan-Dec	---	---	---	---	---	---	---
Bluechief-----	C	Jan-Dec	---	---	---	---	---	---	---
Rock outcrop-----	D	Jan-Dec	---	---	---	---	---	---	---
516: Kaito-----	B	Jan-Dec	---	---	---	---	---	---	---
Claysprings-----	D	Jan-Dec	---	---	---	---	---	---	---
517: Moffat-----	B	Jan-Dec	---	---	---	---	---	---	---
518: Tohatin-----	B	Jan-Dec	---	---	---	---	---	---	---
Sheppard-----	A	Jan-Dec	---	---	---	---	---	---	---
519: Shumbegay-----	B	Jan-Dec	---	---	---	---	---	---	---
520: Rock outcrop-----	D	Jan-Dec	---	---	---	---	---	---	---
Needle-----	D	Jan-Dec	---	---	---	---	---	---	---
521: Sandbench-----	B	Jan-Dec	---	---	---	---	---	---	---
Sheppard-----	A	Jan-Dec	---	---	---	---	---	---	---

Table 17.--Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			Ft	Ft	Ft				
522: Pennell-----	D	Jan-Dec	---	---	---	---	---	---	---
523: Tyende-----	B	Jan-Dec	---	---	---	---	---	---	---
Aneth-----	B	Jan-Dec	---	---	---	---	---	---	---
Shumbegay-----	B	Jan-Dec	---	---	---	---	---	---	---
524: Uzaneva-----	D	March	---	---	---	---	---	Very brief	Rare
		April	---	---	---	---	---	Very brief	Rare
		May	---	---	---	---	---	Very brief	Rare
		June	---	---	---	---	---	Very brief	Rare
		July	---	---	---	---	---	Very brief	Rare
		August	---	---	---	---	---	Very brief	Rare
525: Rock outcrop-----	D	Jan-Dec	---	---	---	---	---	---	---
526: Sandbench-----	B	Jan-Dec	---	---	---	---	---	---	---
Rock outcrop-----	D	Jan-Dec	---	---	---	---	---	---	---
Piute, cool-----	D	Jan-Dec	---	---	---	---	---	---	---
527: Outpost-----	C	July	---	---	---	---	---	Very brief	Occasional
		August	---	---	---	---	---	Very brief	Occasional
		September	---	---	---	---	---	Very brief	Occasional
528: Mack-----	B	Jan-Dec	---	---	---	---	---	---	---
600: Kunz-----	B	Jan-Dec	---	---	---	---	---	---	---
Yahmore-----	B	Jan-Dec	---	---	---	---	---	---	---
602: Bostwick-----	B	Jan-Dec	---	---	---	---	---	---	---

Table 17.--Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			Ft	Ft	Ft				
602: Canburn-----	D	April	1.0-2.0	>6.0	---	---	---	---	---
		May	1.0-2.0	>6.0	---	---	---	---	---
		June	1.0-2.0	>6.0	---	---	---	---	---
		July	1.0-2.0	>6.0	---	---	---	Very brief	Occasional
		August	---	---	---	---	---	Very brief	Occasional
		September	---	---	---	---	---	Very brief	Occasional
604: Yahmore-----	B	Jan-Dec	---	---	---	---	---	---	---
Sandark-----	A	Jan-Dec	---	---	---	---	---	---	---
606: Narbona-----	B	Jan-Dec	---	---	---	---	---	---	---
Deza-----	A	April	5.0-6.0	>6.0	---	---	---	---	---
		May	5.0-6.0	>6.0	---	---	---	---	---
		June	5.0-6.0	>6.0	---	---	---	---	---
		July	5.0-6.0	>6.0	---	---	---	---	---
608: Narbona-----	B	Jan-Dec	---	---	---	---	---	---	---
Zilditloi-----	---	Jan-Dec	---	---	---	---	---	---	---
610: Kunz-----	B	Jan-Dec	---	---	---	---	---	---	---
Xankey-----	B	Jan-Dec	---	---	---	---	---	---	---
612: Xankey-----	B	Jan-Dec	---	---	---	---	---	---	---
614: Kunz-----	B	Jan-Dec	---	---	---	---	---	---	---
Tuntsa-----	B	Jan-Dec	---	---	---	---	---	---	---
Yahmore-----	B	Jan-Dec	---	---	---	---	---	---	---
616: Ligai-----	C	Jan-Dec	---	---	---	---	---	---	---

Table 17.--Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			Ft	Ft	Ft				
616: Pastorpeak-----	B	Jan-Dec	---	---	---	---	---	---	---
Rock outcrop-----	D	Jan-Dec	---	---	---	---	---	---	---
618: Zibetod-----	D	Jan-Dec	---	---	---	---	---	---	---
Bigpaw-----	B	Jan-Dec	---	---	---	---	---	---	---
700: Akhoni-----	D	Jan-Dec	---	---	---	---	---	---	---
Retaw-----	D	January	+3.0	+1.0	1.0-3.0	Very long	Frequent	---	---
		February	+4.0	+2.0	2.0-4.0	Very long	Frequent	---	---
		March	+4.0	+2.0	2.0-4.0	Very long	Frequent	---	---
		April	+4.0	+2.0	2.0-4.0	Very long	Frequent	---	---
		May	+4.0	+2.0	2.0-4.0	Very long	Frequent	---	---
		June	+3.0	+1.0	1.0-3.0	Very long	Frequent	---	---
		July	+3.0	+1.0	1.0-3.0	Very long	Frequent	---	---
		August	+2.0	0.0	0.0-2.0	Very long	Frequent	---	---
		September	+2.0	0.0	0.0-2.0	Very long	Frequent	---	---
		October	+2.0	0.0	0.0-2.0	Very long	Frequent	---	---
		November	+3.0	+1.0	1.0-3.0	Very long	Frequent	---	---
		December	+3.0	+1.0	1.0-3.0	Very long	Frequent	---	---
702: Bikeyah-----	C	April	2.0-3.5	>6.0	---	---	---	---	---
		May	2.0-3.5	>6.0	---	---	---	---	---
		June	2.0-3.5	>6.0	---	---	---	---	---
Berland-----	D	Jan-Dec	---	---	---	---	---	---	---
704: Klizhin-----	B	Jan-Dec	---	---	---	---	---	---	---
Captom-----	B	Jan-Dec	---	---	---	---	---	---	---
706: Todacheene-----	B	Jan-Dec	---	---	---	---	---	---	---
Viewpoint-----	D	Jan-Dec	---	---	---	---	---	---	---

Table 17.--Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			Ft	Ft	Ft				
706: Owlspring-----	C	April	2.0-3.5	>6.0	---	---	---	Very brief	Frequent
		May	2.0-3.5	>6.0	---	---	---	Very brief	Frequent
		June	2.0-3.5	>6.0	---	---	---	Very brief	Frequent
		July	2.0-3.5	>6.0	---	---	---	Very brief	Frequent
		August	---	---	---	---	---	Very brief	Frequent
		September	---	---	---	---	---	Very brief	Frequent
708: Tunitcha-----	B	Jan-Dec	---	---	---	---	---	---	---
Bangston-----	A	Jan-Dec	---	---	---	---	---	---	---
710: Akhoni-----	D	Jan-Dec	---	---	---	---	---	---	---
Klizhin-----	B	Jan-Dec	---	---	---	---	---	---	---
712: Sonsela-----	B	Jan-Dec	---	---	---	---	---	---	---
Washpass-----	B	Jan-Dec	---	---	---	---	---	---	---
Viewpoint-----	D	Jan-Dec	---	---	---	---	---	---	---
W: Water-----	---	January	---	---	---	---	---	---	---
		February	---	---	---	---	---	---	---
		March	---	---	---	---	---	---	---
		April	---	---	---	---	---	---	---
		May	---	---	---	---	---	---	---
		June	---	---	---	---	---	---	---
		July	---	---	---	---	---	---	---
		August	---	---	---	---	---	---	---
		September	---	---	---	---	---	---	---
		October	---	---	---	---	---	---	---
		November	---	---	---	---	---	---	---
		December	---	---	---	---	---	---	---
		Jan-Dec	---	---	---	---	---	---	---

Table 18.--Soil Features

(See text for definitions of terms used in this table. Absence of an entry indicates that the feature is not a concern or that data were not estimated.)

Map symbol and soil name	Restrictive layer				Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness		Uncoated steel	Concrete
		In	In				
100: Werito-----	Bedrock (paralithic)	20-40	---	Moderately cemented	Low	High	High
102: Blackston-----	---	---	---	---	Low	High	Moderate
Camac-----	Bedrock (paralithic)	20-40	---	Moderately cemented	Low	High	Moderate
Rock outcrop-----	Bedrock (lithic)	0-0	---	Indurated	---	---	---
105: Hamburn-----	---	---	---	---	Low	High	High
107: Tocito-----	---	---	---	---	Low	High	High
Gullied land-----	---	---	---	---	---	High	High
110: Brimhall-----	Bedrock (paralithic)	40-60	---	Moderately cemented	Low	High	High
Benally-----	Bedrock (paralithic)	40-60	---	Moderately cemented	Low	High	High
Genats-----	Bedrock (paralithic)	20-40	---	Moderately cemented	Low	High	High
113: Gyptur-----	Bedrock (paralithic)	40-60	---	Moderately cemented	Low	High	High
115: Denazar-----	Bedrock (paralithic)	40-60	---	Moderately cemented	Low	High	Moderate
Farb-----	Bedrock (lithic)	5-10	---	Indurated	Low	High	Moderate
117: Badland-----	Bedrock (paralithic)	0-3	---	Moderately cemented	---	---	---
Rock outcrop-----	Bedrock (lithic)	0-0	---	Indurated	---	---	---
120: Nageezi-----	---	---	---	---	Low	High	Moderate
Denazar-----	---	---	---	---	Low	High	Moderate
122: Blueflat-----	Bedrock (paralithic)	20-40	---	Moderately cemented	Low	High	High
Notal-----	---	---	---	---	Low	High	High

Table 18.--Soil Features--Continued

Map symbol and soil name	Restrictive layer				Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness		Uncoated steel	Concrete
		In	In				
125: Kimbeto-----	Bedrock (paralithic)	40-60	---	Moderately cemented	Low	High	High
130: Badland-----	Bedrock (paralithic)	0-3	---	Moderately cemented	---	---	---
Genats-----	Bedrock (paralithic)	20-40	---	Moderately cemented	Low	High	High
133: Razito-----	---	---	---	---	Low	High	Low
135: Farb-----	Bedrock (lithic)	5-10	---	Indurated	Low	High	Moderate
Rock outcrop-----	Bedrock (lithic)	0-0	---	Indurated	---	---	---
Badland-----	Bedrock (paralithic)	0-3	---	Moderately cemented	---	---	---
137: Persayo-----	Bedrock (paralithic)	10-20	---	Moderately cemented	Low	High	High
Cairn-----	Bedrock (paralithic)	40-60	---	Moderately cemented	Low	High	High
Patel-----	Bedrock (paralithic)	20-40	---	Moderately cemented	Low	High	High
140: Benally-----	---	---	---	---	Low	High	High
142: Bebeevar-----	---	---	---	---	Low	High	Moderate
Walrees-----	---	---	---	---	Moderate	High	Moderate
145: Razito-----	---	---	---	---	Low	High	Low
Huerfano-----	Bedrock (paralithic)	10-20	---	Moderately cemented	Low	High	High
147: Escavada-----	---	---	---	---	Low	High	Low
150: Chipeta-----	Bedrock (paralithic)	10-20	---	Moderately cemented	Low	High	High
Badland-----	Bedrock (paralithic)	0-3	---	Moderately cemented	---	---	---
Moncisco-----	---	---	---	---	Low	High	High

Table 18.--Soil Features--Continued

Map symbol and soil name	Restrictive layer				Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness		Uncoated steel	Concrete
		In	In				
153:							
Green River-----	---	---	---	---	Moderate	High	High
Green River, saline----	---	---	---	---	Moderate	High	High
155:							
Mesa-----	---	---	---	---	Low	High	Moderate
157:							
Werjo, saline-----	---	---	---	---	Moderate	High	High
Werjo-----	---	---	---	---	Moderate	High	High
160:							
Notal-----	---	---	---	---	Low	High	High
Escavada-----	---	---	---	---	Low	High	Moderate
Riverwash-----	---	---	---	---	---	---	---
163:							
Werlog-----	---	---	---	---	Moderate	High	High
165:							
Jeddito-----	---	---	---	---	Low	High	Moderate
Escavada-----	---	---	---	---	Low	High	Moderate
167:							
Hoskay-----	---	---	---	---	Low	High	High
Patel-----	Bedrock (paralithic)	20-40	---	Moderately cemented	Low	High	High
Badland-----	Bedrock (paralithic)	0-3	---	Moderately cemented	---	---	---
170:							
Notal-----	---	---	---	---	Low	High	High
173:							
Shiprock-----	---	---	---	---	Low	Moderate	Low
175:							
Suwanee-----	---	---	---	---	Low	High	Moderate
177:							
Notal-----	---	---	---	---	Low	High	High
180:							
Kimбето-----	Bedrock (paralithic)	40-60	---	Moderately cemented	Low	High	High
Huerfano-----	Bedrock (paralithic)	10-20	---	Moderately cemented	Low	High	High

Table 18.--Soil Features--Continued

Map symbol and soil name	Restrictive layer				Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness		Uncoated steel	Concrete
		In	In				
183: Gyptur-----	---	---	---	---	Low	High	High
190: Jeddito-----	---	---	---	---	Low	High	Moderate
195: Tewa-----	---	---	---	---	Low	High	High
200: Tocito-----	---	---	---	---	Low	High	High
205: Shiprock-----	---	---	---	---	Low	High	Moderate
Farb-----	Bedrock (lithic)	5-10	---	Indurated	Low	High	Moderate
210: Mack-----	---	---	---	---	Low	High	Moderate
Mesa-----	---	---	---	---	Low	High	Moderate
215: Persayo-----	Bedrock (paralithic)	10-20	---	Moderately cemented	Low	High	High
Fordbutte-----	Bedrock (paralithic)	20-40	---	Moderately cemented	Low	High	High
220: Chinde-----	---	---	---	---	Low	High	High
230: Ravola-----	---	---	---	---	Low	High	High
235: Wingrock-----	---	---	---	---	Low	High	Moderate
Rock outcrop-----	Bedrock (lithic)	0-0	---	Indurated	---	---	---
240: Nageezi-----	---	---	---	---	Low	High	Moderate
245: Tsebitai-----	---	---	---	---	Low	High	High
250: Littlehat-----	Bedrock (paralithic)	20-40	---	Moderately cemented	Low	High	High
Persayo-----	Bedrock (paralithic)	10-20	---	Moderately cemented	Low	High	High
Nataani-----	Bedrock (paralithic)	20-40	---	Moderately cemented	Low	High	High
255: Benally-----	---	---	---	---	Low	High	High

Table 18.--Soil Features--Continued

Map symbol and soil name	Restrictive layer				Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness		Uncoated steel	Concrete
		In	In				
260: Littlehat-----	Bedrock (paralithic)	20-40	---	Moderately cemented	Low	High	High
Persayo-----	Bedrock (paralithic)	10-20	---	Moderately cemented	Low	High	High
Badland-----	Bedrock (paralithic)	0-3	---	Moderately cemented	---	---	---
265: Camac-----	Bedrock (paralithic)	20-40	---	Moderately cemented	Low	High	Moderate
Kimbeto-----	---	---	---	---	Low	High	High
Badland-----	Bedrock (paralithic)	0-3	---	Moderately cemented	---	---	---
270: Fruitland-----	---	---	---	---	Low	High	Moderate
275: Razito-----	---	---	---	---	Low	High	Low
285: Water-----	---	---	---	---	---	---	---
Riverwash-----	---	---	---	---	---	---	---
290: Mesa-----	---	---	---	---	Low	High	Moderate
295: Mesa-----	---	---	---	---	Low	High	Moderate
300: Farview-----	Bedrock (lithic)	4-10	---	Indurated	Low	High	Moderate
Rock outcrop-----	Bedrock (lithic)	0-0	---	Indurated	---	---	---
301: Farview-----	Bedrock (lithic)	4-10	---	Indurated	Low	High	Moderate
Sanostee-----	Bedrock (lithic)	20-40	---	Indurated	Low	High	Moderate
Rock outcrop-----	Bedrock (lithic)	0-0	---	Indurated	---	---	---
302: Doakum-----	Bedrock (lithic)	40-60	---	Indurated	Low	High	Moderate
303: Snapill-----	Bedrock (paralithic)	40-60	---	Moderately cemented	Low	High	Moderate

Table 18.--Soil Features--Continued

Map symbol and soil name	Restrictive layer				Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness		Uncoated steel	Concrete
		In	In				
304:							
Farview-----	Bedrock (lithic)	4-10	---	Indurated	Low	High	Moderate
Beclabito-----	Bedrock (lithic)	40-60	---	Indurated	Low	High	High
Rock outcrop-----	Bedrock (lithic)	0-0	---	Indurated	---	---	---
305:							
Strych-----	---	---	---	---	Low	High	Low
Eagleeye-----	Bedrock (paralithic)	10-20	---	Moderately cemented	Low	High	High
Rock outcrop-----	Bedrock (lithic)	0-0	---	Indurated	---	---	---
306:							
Arches-----	Bedrock (lithic)	10-20	---	Indurated	Low	High	Low
Kitsili-----	---	---	---	---	Low	High	Low
Mido-----	---	---	---	---	Low	Moderate	Low
307:							
Bodot-----	Bedrock (paralithic)	20-40	---	Moderately cemented	Low	High	Moderate
Beclabito-----	Bedrock (paralithic)	40-60	---	Moderately cemented	Low	High	High
Rock outcrop-----	Bedrock (lithic)	0-0	---	Indurated	---	---	---
308:							
Mcelmo-----	Bedrock (paralithic)	40-60	---	Moderately cemented	Low	High	High
Farview-----	Bedrock (lithic)	4-10	---	Indurated	Low	High	Moderate
309:							
Rock outcrop-----	Bedrock (lithic)	0-0	---	Indurated	---	---	---
Rizno-----	Bedrock (lithic)	4-10	---	Indurated	Low	High	Low
310:							
Millett-----	---	---	---	---	Low	High	Moderate
Blanding-----	---	---	---	---	Low	High	Low
Strych-----	---	---	---	---	Low	High	Moderate
311:							
Kinusta-----	Bedrock (paralithic)	10-20	---	Moderately cemented	Low	High	Low
Eslendo-----	Bedrock (paralithic)	10-20	---	Moderately cemented	Low	High	Low
Rock outcrop-----	Bedrock (lithic)	0-0	---	Indurated	---	---	---

Table 18.--Soil Features--Continued

Map symbol and soil name	Restrictive layer				Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness		Uncoated steel	Concrete
		In	In				
312: Blanding-----	---	---	---	---	Low	High	Low
313: Marjane-----	Bedrock (lithic)	20-40	---	Indurated	Low	High	Low
Kitsili-----	---	---	---	---	Low	High	Low
314: Mido-----	---	---	---	---	Low	Moderate	Low
315: Shoegame-----	---	---	---	---	Low	Moderate	Low
Riverwash-----	---	---	---	---	---	High	Low
316: Millett-----	---	---	---	---	Low	Moderate	Low
Strych-----	---	---	---	---	Low	High	Low
Doakum-----	---	---	---	---	Low	High	Moderate
317: Toadlena-----	Bedrock (paralithic)	10-20	---	Moderately cemented	Low	High	High
Eagleeye-----	Bedrock (paralithic)	10-20	---	Moderately cemented	Low	High	High
318: Camino-----	---	---	---	---	Low	High	High
319: Skyhawk-----	Bedrock (paralithic)	20-40	---	Moderately cemented	Low	High	Low
Lavellga-----	---	---	---	---	Low	High	Moderate
320: Beclabito-----	Bedrock (paralithic)	20-40	---	Moderately cemented	Low	High	High
Kinusta-----	Bedrock (paralithic)	10-20	---	Moderately cemented	Low	High	Low
Badland-----	Bedrock (paralithic)	0-3	---	Moderately cemented	---	---	---
400: Wetherill-----	---	---	---	---	Moderate	Moderate	Low
Atlatl-----	Bedrock (lithic)	20-40	---	Indurated	Moderate	Moderate	Low
401: Vessilla-----	Bedrock (lithic)	4-10	---	Indurated	Moderate	Moderate	Low
Rock outcrop-----	Bedrock (lithic)	0-0	---	Indurated	---	---	---

Table 18.--Soil Features--Continued

Map symbol and soil name	Restrictive layer				Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness		Uncoated steel	Concrete
		In	In				
402: Chazner-----	Petrocalcic	20-40	4-20	Indurated	Moderate	Low	Low
403: Chazner-----	Petrocalcic	20-40	4-20	Indurated	Moderate	Low	Low
Katzine-----	---	---	---	---	Moderate	Moderate	Low
404: Wetherill-----	---	---	---	---	Moderate	Moderate	Low
Tsezhin-----	---	---	---	---	Moderate	High	Low
406: Rock outcrop-----	Bedrock (lithic)	0-0	---	Indurated	---	---	---
Nizhoni-----	Bedrock (lithic)	6-10	---	Indurated	Moderate	Low	Low
407: Iwela-----	---	---	---	---	Moderate	Moderate	Low
Nomrah-----	---	---	---	---	Moderate	Moderate	Low
Vosburg-----	---	---	---	---	Moderate	Moderate	Low
408: Nizhoni-----	Bedrock (lithic)	6-10	---	Indurated	Moderate	Low	Low
Rock outcrop-----	Bedrock (lithic)	0-0	---	Indurated	---	---	---
409: Chinlini-----	Petrocalcic	40-60	4-20	Indurated	Moderate	High	Low
410: Wetherill-----	---	---	---	---	Moderate	High	Low
411: Sojourn-----	Bedrock (paralithic)	10-20	---	Moderately cemented	Moderate	High	Low
Badland-----	Bedrock (paralithic)	0-3	---	Moderately cemented	---	---	---
412: Highdye-----	Bedrock (lithic)	10-20	---	Indurated	Low	High	Low
Menefee-----	Bedrock (paralithic)	10-20	---	Moderately cemented	Moderate	Moderate	Low
413: Hozho-----	Bedrock (paralithic)	10-20	---	Moderately cemented	Low	Moderate	Low
Quezcan-----	Bedrock (paralithic)	20-40	---	Moderately cemented	Low	High	Moderate
Rock outcrop-----	Bedrock (lithic)	0-0	---	Indurated	---	---	---

Table 18.--Soil Features--Continued

Map symbol and soil name	Restrictive layer				Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness		Uncoated steel	Concrete
		In	In				
414:							
Arabrab-----	Bedrock (lithic)	10-20	---	Indurated	Moderate	Moderate	Low
Wetherill-----	Bedrock (lithic)	40-60	---	Indurated	Moderate	Moderate	Low
415:							
Tsezhin-----	---	---	---	---	Moderate	Moderate	Low
416:							
Arabrab-----	Bedrock (lithic)	10-20	---	Indurated	Moderate	Moderate	Low
Rock outcrop-----	Bedrock (lithic)	0-0	---	Indurated	---	---	---
417:							
Wetherill-----	---	---	---	---	Moderate	Moderate	Low
418:							
Menefee-----	Bedrock (paralithic)	10-20	---	Moderately cemented	Moderate	Moderate	Low
Espiritu-----	---	---	---	---	Moderate	Moderate	Low
Rock outcrop-----	Bedrock (lithic)	0-0	---	Indurated	---	---	---
500:							
Whit-----	---	---	---	---	Low	High	Low
501:							
Escavada-----	---	---	---	---	Low	High	Moderate
Riverwash-----	---	---	---	---	---	---	---
502:							
Sogzie-----	---	---	---	---	Low	Moderate	Low
503:							
Claysprings-----	Bedrock (paralithic)	10-20	---	Moderately cemented	Low	High	High
Badland-----	Bedrock (paralithic)	0-3	---	Moderately cemented	---	---	---
504:							
Tohona-----	Bedrock (paralithic)	30-40	---	Moderately cemented	Low	High	High
Kimnoli-----	Bedrock (lithic)	7-10	---	Indurated	Low	Moderate	Low
Claysprings-----	Bedrock (paralithic)	10-20	---	Moderately cemented	Low	High	High
505:							
Recapture-----	---	---	---	---	Low	High	High
Shorthair-----	Bedrock (lithic)	10-20	---	Indurated	Low	High	High
Aneth-----	---	---	---	---	Low	Moderate	Low

Table 18.--Soil Features--Continued

Map symbol and soil name	Restrictive layer				Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness		Uncoated steel	Concrete
		In	In				
506: Blackston-----	---	---	---	---	Low	High	Moderate
Grazane-----	Bedrock (paralithic)	20-40	---	Moderately cemented	Low	High	Moderate
507: Sheppard-----	---	---	---	---	Low	Moderate	Low
508: Shalet-----	Bedrock (paralithic)	10-20	---	Moderately cemented	Low	High	High
Rock outcrop-----	Bedrock (lithic)	0-0	---	Indurated	---	---	---
509: Trail-----	---	---	---	---	Low	High	Low
510: Aneth-----	---	---	---	---	Low	Moderate	Low
511: Redlands-----	---	---	---	---	Low	High	Moderate
512: Gotho-----	---	---	---	---	Low	High	High
513: Sogzie-----	Bedrock (paralithic)	40-60	---	Moderately cemented	Low	High	Moderate
Aneth-----	---	---	---	---	Low	Moderate	Low
514: Aneth-----	---	---	---	---	Low	Moderate	Low
515: Piute-----	Bedrock (lithic)	4-10	---	Indurated	Low	Moderate	Low
Bluechief-----	Bedrock (lithic)	20-40	---	Indurated	Low	High	Low
Rock outcrop-----	Bedrock (lithic)	0-0	---	Indurated	---	---	---
516: Kaito-----	Bedrock (paralithic)	40-60	---	Moderately cemented	Low	High	Moderate
Claysprings-----	Bedrock (paralithic)	10-20	---	Moderately cemented	Low	High	High
517: Moffat-----	---	---	---	---	Low	High	Low
518: Tohatin-----	---	---	---	---	Low	Moderate	Low
Sheppard-----	---	---	---	---	Low	Moderate	Low

Table 18.--Soil Features--Continued

Map symbol and soil name	Restrictive layer				Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness		Uncoated steel	Concrete
		In	In				
519: Shumbegay-----	---	---	---	---	Low	High	Low
520: Rock outcrop-----	Bedrock (lithic)	0-0	---	Indurated	---	---	---
Needle-----	Bedrock (lithic)	10-20	---	Indurated	Low	Moderate	Low
521: Sandbench-----	Bedrock (lithic)	20-40	---	Indurated	Low	High	Low
Sheppard-----	---	---	---	---	Low	Moderate	Low
522: Pennell-----	Bedrock (lithic)	10-20	---	Indurated	Low	High	Low
523: Tyende-----	Bedrock (paralithic)	20-40	---	Moderately cemented	Low	High	High
Aneth-----	---	---	---	---	Low	Moderate	Low
Shumbegay-----	---	---	---	---	Low	High	Low
524: Uzaneva-----	---	---	---	---	Low	High	Moderate
525: Rock outcrop-----	Bedrock (lithic)	0-0	---	Indurated	---	---	---
526: Sandbench-----	Bedrock (lithic)	20-40	---	Indurated	Low	High	Low
Rock outcrop-----	Bedrock (lithic)	0-0	---	Indurated	---	---	---
Piute, cool-----	Bedrock (lithic)	4-10	---	Indurated	Low	Moderate	Low
527: Outpost-----	---	---	---	---	Low	High	High
528: Mack-----	---	---	---	---	Low	High	Moderate
600: Kunz-----	---	---	---	---	Moderate	Moderate	Low
Yahmore-----	---	---	---	---	Moderate	Low	Low
602: Bostwick-----	---	---	---	---	Moderate	Low	Low
Canburn-----	---	---	---	---	High	High	Low
604: Yahmore-----	---	---	---	---	Moderate	Low	Low
Sandark-----	---	---	---	---	Low	Low	Low

Table 19.--Classification of the Soils

(An asterisk in the first column indicates a taxadjunct to the series. See text for a description of those characteristics that are outside the range of the series.)

Soil name	Family or higher taxonomic class
Akhoni-----	Loamy, mixed, Lithic Haploborolls
Aneth-----	Sandy, mixed, mesic Typic Torriorthents
Arabrab-----	Loamy, mixed, mesic Lithic Haplustalfs
Arches-----	Mixed, mesic Lithic Torripsamments
Atlatl-----	Coarse-loamy, carbonatic, mesic Calciorthidic Ustochrepts
Bangston-----	Sandy, mixed Typic Cryoborolls
Bebeever-----	Sandy, mixed, mesic Oxyaquic Torrifluvents
Beclabito-----	Fine-loamy, mixed, mesic Haplic Natrargids
Benally-----	Fine-loamy, mixed, mesic Typic Natrargids
Berland-----	Loamy, mixed, Lithic Argiborolls
Bigpaw-----	Fine-silty, mixed, Pachic Argiborolls
Bikeyah-----	Coarse-loamy, mixed, Pachic Haploborolls
Blackston-----	Loamy-skeletal, mixed, mesic Typic Calciorthids
Blanding-----	Fine-silty, mixed, mesic Ustalfic Haplargids
Bluechief-----	Coarse-loamy, mixed, mesic Typic Calciorthids
Blueflat-----	Fine, mixed, mesic Cambic Gypsiorthids
Bodot-----	Fine, montmorillonitic (calcareous), mesic Ustertic Torriorthents
Bostwick-----	Fine-loamy, mixed, Aridic Argiborolls
Brimhall-----	Coarse-loamy, mixed, mesic Calcic Gypsiorthids
Cairn-----	Loamy-skeletal, carbonatic, mesic Typic Haplargids
Camac-----	Fine-loamy, mixed, mesic Typic Camborthids
*Camino-----	Fine, mixed, mesic Ustollic Camborthids
Canburn-----	Fine-loamy, mixed (calcareous), Cumulic Endoaquolls
Captom-----	Loamy, mixed, Arenic Eutroboralfs
Chazner-----	Fine-loamy, carbonatic, mesic Petrocalcic Paleustalfs
Chinde-----	Fine, mixed, mesic Cambic Gypsiorthids
Chinlini-----	Fine-silty, mixed, mesic Petrocalcic Paleustalfs
Chipeta-----	Clayey, mixed (calcareous), mesic, shallow Typic Torriorthents
Claysprings-----	Clayey, montmorillonitic (calcareous), mesic, shallow Typic Torriorthents
Denazar-----	Sandy, mixed, mesic Typic Calciorthids
Deza-----	Sandy, mixed, Psammentic Eutroboralfs
Doakum-----	Fine-loamy, mixed, mesic Ustalfic Haplargids
Eagleye-----	Clayey, mixed, nonacid, mesic, shallow Ustic Torriorthents
Escavada-----	Sandy, mixed, mesic Ustic Torrifluvents
Eslando-----	Loamy, mixed (calcareous), mesic, shallow Ustic Torriorthents
Espiritu-----	Loamy-skeletal, mixed, mesic Aridic Haplustalfs
Farb-----	Loamy, mixed (calcareous), mesic Lithic Torriorthents
Farview-----	Loamy, mixed (calcareous), mesic Lithic Ustic Torriorthents
Fordbutte-----	Fine-silty, mixed, mesic Typic Camborthids
Fruitland-----	Coarse-loamy, mixed (calcareous), mesic Typic Torriorthents
Genats-----	Fine, mixed, nonacid, mesic Typic Torriorthents
Gotho-----	Fine-loamy, mixed (calcareous), mesic Typic Torriorthents
Grazane-----	Fine-loamy, mixed, mesic Typic Haplargids
Green River-----	Coarse-loamy, mixed (calcareous), mesic Oxyaquic Ustifluvents
Gyptur-----	Fine-silty, mixed, mesic Cambic Gypsiorthids
Hamburn-----	Fine-loamy, mixed (calcareous), mesic Ustic Torrifluvents
Highdye-----	Clayey, mixed, mesic Lithic Haplustalfs
Hoskay-----	Fine, mixed, mesic Vertic Natrargids
Hozho-----	Mixed, mesic, shallow Typic Ustipsamments
Huerfano-----	Loamy, mixed, mesic, shallow Typic Natrargids
Iwela-----	Fine-loamy, mixed, mesic Aridic Haplustalfs
Jeddito-----	Coarse-loamy, mixed (calcareous), mesic Typic Torriorthents
Kaito-----	Coarse-loamy, mixed, mesic Typic Calciorthids
Katzine-----	Loamy-skeletal, mixed, mesic Calciorthidic Ustochrepts
Kimбето-----	Fine-loamy, mixed, mesic Haplic Natrargids
Kimnoli-----	Loamy, mixed, mesic Lithic Haplargids
Kinusta-----	Loamy, mixed (calcareous), mesic, shallow Ustic Torriorthents
Kitsili-----	Coarse-loamy, mixed, mesic Ustochreptic Camborthids
Klizhin-----	Coarse-loamy, mixed, Pachic Haploborolls

Table 19.--Classification of the Soils--Continued

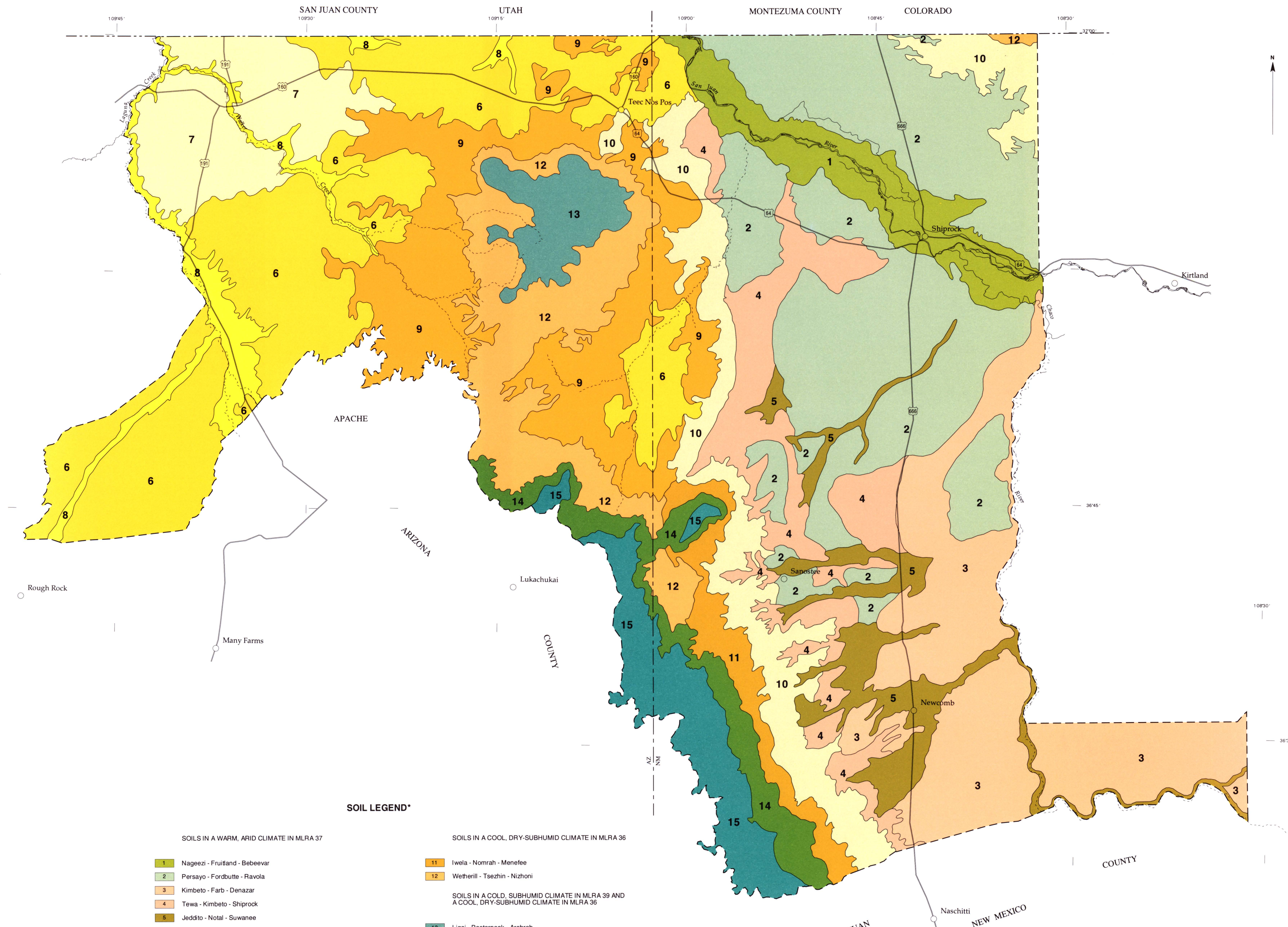
Soil name	Family or higher taxonomic class
Kunz-----	Fine-loamy, mixed, Mollic Eutroboralfs
Lavellga-----	Loamy-skeletal, carbonatic, mesic Ustollic Haplargids
Ligai-----	Loamy-skeletal, mixed, mesic Typic Argiustolls
Littlehat-----	Fine-silty, mixed (calcareous), mesic Typic Torriorthents
Mack-----	Fine-loamy, mixed, mesic Typic Haplargids
Marjane-----	Coarse-loamy, mixed, mesic Ustalfic Haplargids
Mcelmo-----	Fine, montmorillonitic, mesic Typic Natrargids
Menefee-----	Loamy, mixed (calcareous), mesic, shallow Aridic Ustorthents
Mesa-----	Fine-loamy, mixed, mesic Typic Haplargids
Mido-----	Mixed, mesic Ustic Torripsamments
Millett-----	Fine-loamy, mixed, mesic Ustollic Haplargids
Moffat-----	Coarse-loamy, mixed, mesic Typic Calciorthids
Moncisco-----	Loamy-skeletal over fragmental, mixed, mesic Typic Calciorthids
Nageezi-----	Coarse-loamy, mixed, mesic Typic Calciorthids
Narbona-----	Loamy-skeletal, mixed, Arenic Eutroboralfs
Nataani-----	Coarse-silty, mixed, mesic Cambic Gypsiorthids
Needle-----	Mixed, mesic Lithic Torripsamments
Nizhoni-----	Loamy, mixed (calcareous), mesic Lithic Ustorthents
Nomrah-----	Fine-loamy, mixed, mesic Aridic Haplustalfs
Notal-----	Fine, mixed (calcareous), mesic Typic Torriorthents
Outpost-----	Clayey over loamy, mixed (calcareous), mesic Vertic Torrifluvents
Owlspring-----	Fine-silty, mixed, Pachic Argiborolls
Pastorpeak-----	Loamy-skeletal, mixed, Pachic Argiborolls
Patel-----	Fine, mixed, mesic Typic Natrargids
Pennell-----	Loamy, mixed, mesic Lithic Calciorthids
Persayo-----	Loamy, mixed (calcareous), mesic, shallow Typic Torriorthents
Piute-----	Sandy, mixed, mesic Lithic Torriorthents
Quezcan-----	Fine, montmorillonitic (calcareous), mesic Aridic Ustorthents
Ravola-----	Fine-silty, mixed (calcareous), mesic Typic Torrifluvents
Razito-----	Mixed, mesic Typic Torripsamments
Recapture-----	Fine-loamy, mixed, mesic Typic Natrargids
Redlands-----	Fine-loamy, mixed, mesic Typic Haplargids
Retaw-----	Fine-loamy, mixed, frigid Histic Epiaquolls
Rizno-----	Loamy, mixed (calcareous), mesic Lithic Ustic Torriorthents
Sandark-----	Sandy, mixed, Entic Haploborolls
Sandbench-----	Sandy, mixed, mesic Typic Calciorthids
Sanostee-----	Fine-loamy, mixed, mesic Ustalfic Haplargids
Shalet-----	Loamy, mixed (calcareous), mesic, shallow Typic Torriorthents
Sheppard-----	Mixed, mesic Typic Torripsamments
Shiprock-----	Coarse-loamy, mixed, mesic Typic Haplargids
Shoegame-----	Sandy-skeletal, mixed, mesic Ustochreptic Calciorthids
Shorthair-----	Loamy, mixed, mesic Lithic Natrargids
Shumbegay-----	Sandy, mixed, mesic Typic Torriorthents
Skyhawk-----	Fine-silty, mixed, mesic Ustollic Haplargids
Snapill-----	Fine-silty, mixed, mesic Ustalfic Haplargids
Sogzie-----	Coarse-loamy, mixed, mesic Typic Haplargids
Sojourn-----	Loamy, mixed (calcareous), mesic, shallow Aridic Ustorthents
Sonsela-----	Loamy-skeletal, mixed, Mollic Eutroboralfs
Strych-----	Loamy-skeletal, mixed, mesic Ustollic Calciorthids
Suwanee-----	Fine-loamy, mixed (calcareous), mesic Ustic Torrifluvents
Tewa-----	Fine-loamy, mixed, mesic Typic Camborthids
Toadlena-----	Loamy, mixed, mesic, shallow Cambic Gypsiorthids
Tocito-----	Fine-silty, mixed (calcareous), mesic Typic Torriorthents
Todacheene-----	Fine-loamy, mixed, Pachic Argiborolls
Tohatin-----	Sandy, mixed, mesic Typic Calciorthids
Tohona-----	Fine, montmorillonitic, mesic Typic Natrargids
Trail-----	Sandy, mixed, mesic Typic Torrifluvents
Tsebitai-----	Coarse-silty, mixed, mesic Typic Camborthids
Tsezhin-----	Loamy-skeletal, mixed, mesic Aridic Haplustalfs
Tunitcha-----	Fine-loamy, mixed, Mollic Eutroboralfs
Tuntsa-----	Coarse-loamy, mixed, Pachic Haploborolls
Tyende-----	Coarse-loamy, mixed, mesic Typic Natrargids
Uzaneva-----	Fine, montmorillonitic, mesic Haplic Natrargids
Vessilla-----	Loamy, mixed (calcareous), mesic Lithic Ustorthents

Table 19.--Classification of the Soils--Continued

Soil name	Family or higher taxonomic class
Viewpoint-----	Loamy, mixed, Lithic Argiborolls
Vosburg-----	Fine-loamy, mixed, mesic Pachic Argiustolls
Walrees-----	Fine-loamy over sandy or sandy-skeletal, mixed (calcareous), mesic Oxyaquic Ustifluvents
Washpass-----	Coarse-loamy, mixed Argic Cryoborolls
Werito-----	Fine, mixed, mesic Typic Camborthids
Werjo-----	Fine-loamy, mixed (calcareous), mesic Aquic Torrifluvents
Werlog-----	Fine-loamy, mixed (calcareous), mesic Aquic Ustifluvents
Wetherill-----	Fine-silty, mixed, mesic Aridic Haplustalfs
Whit-----	Fine-silty, mixed, mesic Typic Haplargids
Wingrock-----	Coarse-loamy, mixed, mesic Typic Camborthids
Xankey-----	Loamy-skeletal, mixed, Mollic Eutroboralfs
Yahmore-----	Coarse-loamy, mixed, Pachic Argiborolls
Zibetod-----	Loamy-skeletal, mixed, Lithic Argiborolls

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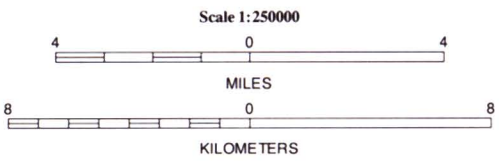


SOIL LEGEND*

SOILS IN A WARM, ARID CLIMATE IN MLRA 37		SOILS IN A COOL, DRY-SUBHUMID CLIMATE IN MLRA 36	
1	Nageezi - Fruitland - Bebevar	11	Iwela - Nomrah - Menefee
2	Persayo - Fordbutte - Ravola	12	Wetherill - Tsezhin - Nizhoni
3	Kimbeto - Farb - Denazar	SOILS IN A COLD, SUBHUMID CLIMATE IN MLRA 39 AND A COOL, DRY-SUBHUMID CLIMATE IN MLRA 36	
4	Tewa - Kimbeto - Shiprock	13	Ligai - Pastorpeak - Arabrab
5	Jeddito - Notal - Suwane	SOILS IN A COLD, SUBHUMID CLIMATE IN MLRA 39	
SOILS AND ROCK OUTCROP IN A WARM, ARID CLIMATE IN MLRA 35		14	Narbona - Yahmore - Kunz
6	Sogzie - Aneth - Whit	15	Akhoni - Tunitcha - Bangston
7	Shepard - Rock outcrop - Piute		
8	Shumbegay - Uzaneva - Trail		
SOILS IN A WARM, SEMIARID CLIMATE IN MLRA 35			
9	Arches - Kitsili - Blanding		
10	Farview - McElmo - Millett		

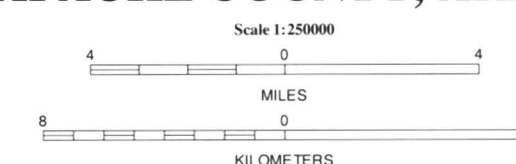
*The units on this legend are described in the text under the heading "General Soil Map Units."
Compiled 2000

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
THE NAVAJO NATION
UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF INDIAN AFFAIRS
NEW MEXICO AGRICULTURAL EXPERIMENT STATION
ARIZONA AGRICULTURAL EXPERIMENT STATION
SHIPROCK SOIL AND WATER CONSERVATION DISTRICT
GENERAL SOIL MAP
SHIPROCK AREA,
PARTS OF SAN JUAN COUNTY, NEW MEXICO
and APACHE COUNTY, ARIZONA





INDEX TO MAP SHEETS
SHIPROCK AREA,
PARTS OF SAN JUAN COUNTY, NEW MEXICO
and APACHE COUNTY, ARIZONA



SOIL LEGEND

Map symbols consist of three numbers.

SYMBOL	NAME
100	WERITO LOAM. 1 TO 3 PERCENT SLOPES
102	BLACKSTON-CAMAC-ROCK OUTCROP COMPLEX. 0 TO 60 PERCENT SLOPES
105	HAMBURN CLAY LOAM. 0 TO 1 PERCENT SLOPES
107	TOCITO-GULLIED LAND COMPLEX. 1 TO 3 PERCENT SLOPES
110	BRIMHALL-BENALLY-GENATS ASSOCIATION. 0 TO 45 PERCENT SLOPES
113	GYPTUR VERY FINE SANDY LOAM. 0 TO 3 PERCENT SLOPES
115	DENAZAR-FARB FINE SANDS. 0 TO 3 PERCENT SLOPES
117	BADLAND-ROCK OUTCROP COMPLEX
120	NAGEEZI-DENAZAR ASSOCIATION. 1 TO 8 PERCENT SLOPES
122	BLUEFLAT-NOTAL ASSOCIATION. 2 TO 10 PERCENT SLOPES
125	KIMBETO LOAMY FINE SAND. 0 TO 4 PERCENT SLOPES
130	BADLAND-GENATS COMPLEX. 35 TO 60 PERCENT SLOPES
133	RAZITO SAND. 1 TO 6 PERCENT SLOPES
135	FARB-ROCK OUTCROP-BADLAND COMPLEX. 2 TO 25 PERCENT SLOPES
137	PERSAYO-CAIRN-PATEL COMPLEX. 1 TO 25 PERCENT SLOPES
140	BENALLY LOAMY SAND. 1 TO 3 PERCENT SLOPES. OVERBLOWN
142	BEBEEVAR-WALREES COMPLEX. 0 TO 2 PERCENT SLOPES
145	RAZITO-HUERFANO COMPLEX. 0 TO 8 PERCENT SLOPES
147	ESCAVADA SAND. 0 TO 1 PERCENT SLOPES
150	CHIPETA-BADLAND-MONCISCO COMPLEX. 2 TO 45 PERCENT SLOPES
153	GREEN RIVER-GREEN RIVER. SALINE FINE SANDY LOAMS. 0 TO 1 PERCENT SLOPES
155	MESA FINE SANDY LOAM. 1 TO 4 PERCENT SLOPES
157	WERJO. SALINE-WERJO LOAMS. 0 TO 1 PERCENT SLOPES
160	NOTAL-ESCAVADA-RIVERWASH ASSOCIATION. 0 TO 1 PERCENT SLOPES
163	WERLOG SILTY CLAY LOAM. 0 TO 1 PERCENT SLOPES
165	JEDDITO-ESCAVADA ASSOCIATION. 0 TO 3 PERCENT SLOPES
167	HOSKAY-PATEL-BADLAND COMPLEX. 1 TO 25 PERCENT SLOPES
170	NOTAL SANDY CLAY LOAM. 0 TO 1 PERCENT SLOPES
173	SHIPROCK FINE SANDY LOAM. 1 TO 3 PERCENT SLOPES
175	SUWANEE LOAM. 0 TO 1 PERCENT SLOPES
177	NOTAL SILTY CLAY LOAM. 1 TO 3 PERCENT SLOPES
180	KIMBETO-HUERFANO COMPLEX. 1 TO 4 PERCENT SLOPES
183	GYPTUR LOAM. 3 TO 15 PERCENT SLOPES
190	JEDDITO LOAMY FINE SAND. 0 TO 2 PERCENT SLOPES
195	TEWA FINE SANDY LOAM. 2 TO 15 PERCENT SLOPES
200	TOCITO SILT LOAM. 1 TO 3 PERCENT SLOPES
205	SHIPROCK-FARB COMPLEX. 1 TO 5 PERCENT SLOPES
210	MACK-MESA FINE SANDY LOAMS. 1 TO 4 PERCENT SLOPES
215	PERSAYO-FORDBUTTE ASSOCIATION. 1 TO 10 PERCENT SLOPES
220	CHINDE LOAM. 0 TO 5 PERCENT SLOPES
230	RAVOLA VERY FINE SANDY LOAM. 1 TO 3 PERCENT SLOPES
235	WINGROCK-ROCK OUTCROP ASSOCIATION. 4 TO 15 PERCENT SLOPES
240	NAGEEZI LOAMY FINE SAND. 1 TO 6 PERCENT SLOPES
245	TSEBITAI VERY FINE SANDY LOAM. 1 TO 3 PERCENT SLOPES
250	LITTLEHAT-PERSAYO-NATAANI COMPLEX. 1 TO 15 PERCENT SLOPES
255	BENALLY FINE SANDY LOAM. 1 TO 5 PERCENT SLOPES
260	LITTLEHAT-PERSAYO-BADLAND COMPLEX. 3 TO 45 PERCENT SLOPES
265	CAMAC-KIMBETO-BADLAND ASSOCIATION. 0 TO 50 PERCENT SLOPES
270	FRUITLAND SANDY CLAY LOAM. 1 TO 3 PERCENT SLOPES
275	RAZITO LOAMY SAND. 3 TO 5 PERCENT SLOPES
285	WATER-RIVERWASH COMPLEX
290	MESA CLAY LOAM. WET. 0 TO 1 PERCENT SLOPES
295	MESA SANDY CLAY LOAM. WET. 0 TO 1 PERCENT SLOPES
300	FARVIEW-ROCK OUTCROP COMPLEX. 1 TO 10 PERCENT SLOPES
301	FARVIEW-SANOSTEE-ROCK OUTCROP ASSOCIATION. 1 TO 10 PERCENT SLOPES
302	DOAKUM FINE SANDY LOAM. 1 TO 10 PERCENT SLOPES
303	SNAPILL VERY FINE SANDY LOAM. 1 TO 6 PERCENT SLOPES
304	FARVIEW-BECLABITO-ROCK OUTCROP COMPLEX. 1 TO 10 PERCENT SLOPES
305	STRYCH-EAGLEYE-ROCK OUTCROP COMPLEX. 15 TO 70 PERCENT SLOPES
306	ARCHES-KITSILI-MIDO COMPLEX. 1 TO 25 PERCENT SLOPES
307	BODOT-BECLABITO-ROCK OUTCROP COMPLEX. 15 TO 65 PERCENT SLOPES
308	MCELMO-FARVIEW COMPLEX. 2 TO 15 PERCENT SLOPES
309	ROCK OUTCROP-RIZNO COMPLEX. 2 TO 20 PERCENT SLOPES
310	MILLETT-BLANDING-STRYCH ASSOCIATION. 2 TO 50 PERCENT SLOPES
311	KINUSTA-ESLENDO-ROCK OUTCROP COMPLEX. 15 TO 70 PERCENT SLOPES
312	BLANDING VERY FINE SANDY LOAM. 2 TO 8 PERCENT SLOPES
313	MARJANE-KITSILI COMPLEX. 2 TO 8 PERCENT SLOPES
314	MIDO LOAMY FINE SAND. 8 TO 45 PERCENT SLOPES
315	SHOEGAME-RIVERWASH COMPLEX. 2 TO 5 PERCENT SLOPES
316	MILLETT-STRYCH-DOAKUM COMPLEX. 5 TO 65 PERCENT SLOPES

SYMBOL	NAME
317	TOADLENA-EAGLEYE COMPLEX. 2 TO 60 PERCENT SLOPES
318	CAMINO SILTY CLAY LOAM. 1 TO 8 PERCENT SLOPES
319	SKYHAWK-LAVELLGA ASSOCIATION. 5 TO 50 PERCENT SLOPES
320	BECLABITO-KINUSTA-BADLAND COMPLEX. 2 TO 45 PERCENT SLOPES
400	WETHERILL-ATLATL ASSOCIATION. 1 TO 15 PERCENT SLOPES
401	VESSILLA-ROCK OUTCROP COMPLEX. 5 TO 25 PERCENT SLOPES
402	CHAZNER VERY COBBLY VERY FINE SANDY LOAM. 5 TO 15 PERCENT SLOPES. EXTREMELY STONY
403	CHAZNER-KATZINE COMPLEX. 5 TO 45 PERCENT SLOPES
404	WETHERILL-TSEZHIN ASSOCIATION. 3 TO 15 PERCENT SLOPES
406	ROCK OUTCROP-NIZHONI COMPLEX. 2 TO 20 PERCENT SLOPES
407	IWELA-NOMRAH-VOSBURG COMPLEX. 1 TO 40 PERCENT SLOPES
408	NIZHONI-ROCK OUTCROP COMPLEX. 2 TO 15 PERCENT SLOPES
409	CHINLINI LOAM. 2 TO 6 PERCENT SLOPES
410	WETHERILL VERY FINE SANDY LOAM. 15 TO 60 PERCENT SLOPES. ERODED
411	SOJOURN-BADLAND COMPLEX. 15 TO 50 PERCENT SLOPES
412	HIGHDYE-MENEFEE ASSOCIATION. 5 TO 35 PERCENT SLOPES
413	HOZHO-QUEZCAN-ROCK OUTCROP COMPLEX. 35 TO 70 PERCENT SLOPES
414	ARABRAB-WETHERILL COMPLEX. 3 TO 15 PERCENT SLOPES
415	TSEZHIN EXTREMELY COBBLY VERY FINE SANDY LOAM. 35 TO 70 PERCENT SLOPES. RUBBLY
416	ARABRAB-ROCK OUTCROP COMPLEX. 15 TO 60 PERCENT SLOPES
417	WETHERILL VERY FINE SANDY LOAM. 5 TO 25 PERCENT SLOPES
418	MENEFEE-ESPIRITU-ROCK OUTCROP COMPLEX. 35 TO 75 PERCENT SLOPES
500	WHIT VERY FINE SANDY LOAM. 1 TO 3 PERCENT SLOPES
501	ESCAVADA-RIVERWASH COMPLEX. 0 TO 1 PERCENT SLOPES
502	SOGZIE LOAMY FINE SAND. 1 TO 5 PERCENT SLOPES
503	CLAYSPRINGS-BADLAND COMPLEX. 35 TO 60 PERCENT SLOPES
504	TOHONA-KIMNOLI-CLAYSPRINGS COMPLEX. 2 TO 45 PERCENT SLOPES
505	RECAPTURE-SHORTHAIR-ANETH COMPLEX. 1 TO 8 PERCENT SLOPES
506	BLACKSTON-GRAZANE ASSOCIATION. 3 TO 50 PERCENT SLOPES
507	SHEPPARD LOAMY FINE SAND. 2 TO 8 PERCENT SLOPES. HUMMOCKY
508	SHALET-ROCK OUTCROP COMPLEX. 8 TO 45 PERCENT SLOPES
509	TRAIL LOAMY FINE SAND. 1 TO 3 PERCENT SLOPES
510	ANETH LOAMY FINE SAND. 1 TO 3 PERCENT SLOPES
511	REDLANDS LOAMY FINE SAND. 1 TO 3 PERCENT SLOPES
512	GOTHO FINE SANDY LOAM. 0 TO 2 PERCENT SLOPES
513	SOGZIE-ANETH ASSOCIATION. 2 TO 8 PERCENT SLOPES
514	ANETH LOAMY FINE SAND. 2 TO 8 PERCENT SLOPES. HUMMOCKY
515	PIUTE-BLUECHIEF-ROCK OUTCROP COMPLEX. 2 TO 25 PERCENT SLOPES
516	KAITO-CLAYSPRINGS COMPLEX. 30 TO 65 PERCENT SLOPES
517	MOFFAT LOAMY FINE SAND. 1 TO 12 PERCENT SLOPES
518	TOHATIN-SHEPPARD LOAMY FINE SANDS. 5 TO 35 PERCENT SLOPES
519	SHUMBEGAY LOAMY FINE SAND. 0 TO 8 PERCENT SLOPES
520	ROCK OUTCROP-NEEDLE COMPLEX. 2 TO 20 PERCENT SLOPES
521	SANDBENCH-SHEPPARD FINE SANDS. 1 TO 8 PERCENT SLOPES
522	PENNELL LOAMY FINE SAND. 1 TO 6 PERCENT SLOPES
523	TYENDE-ANETH-SHUMBEGAY LOAMY FINE SANDS. 1 TO 25 PERCENT SLOPES
524	UZANEVA CLAY LOAM. 0 TO 2 PERCENT SLOPES
525	ROCK OUTCROP
526	SANDBENCH-ROCK OUTCROP-PIUTE. COOL COMPLEX. 1 TO 8 PERCENT SLOPES
527	OUTPOST SANDY CLAY LOAM. 0 TO 2 PERCENT SLOPES
528	MACK FINE SANDY LOAM. 1 TO 3 PERCENT SLOPES
600	KUNZ-YAHMORE COMPLEX. 2 TO 35 PERCENT SLOPES
602	BOSTWICK-CANBURN COMPLEX. 0 TO 5 PERCENT SLOPES
604	YAHMORE-SANDARK COMPLEX. 1 TO 15 PERCENT SLOPES
606	NARBONA-DEZA COMPLEX. 5 TO 50 PERCENT SLOPES
608	NARBONA-ZILDITLOI COMPLEX. 45 TO 90 PERCENT SLOPES
610	KUNZ-XANKEY COMPLEX. 5 TO 45 PERCENT SLOPES
612	XANKEY VERY COBBLY LOAM. 45 TO 70 PERCENT SLOPES. EXTREMELY BOULDERY
614	KUNZ-TUNTSY-YAHMORE COMPLEX. 3 TO 45 PERCENT SLOPES
616	LIGAI-PASTORPEAK-ROCK OUTCROP COMPLEX. 35 TO 95 PERCENT SLOPES
618	ZIBETOD-BIGPAW COMPLEX. 5 TO 35 PERCENT SLOPES
700	AKHONI-RETAW COMPLEX. 0 TO 15 PERCENT SLOPES
702	BIKEYAH-BERLAND LOAMS. 1 TO 15 PERCENT SLOPES
704	KLIZHIN-CAPTOM COMPLEX. 15 TO 60 PERCENT SLOPES
706	TODACHEENE-VIEWPOINT-OWLSRING ASSOCIATION. 1 TO 20 PERCENT SLOPES
708	TUNITCHA-BANGSTON ASSOCIATION. 35 TO 60 PERCENT SLOPES
710	AKHONI-KLIZHIN FINE SANDY LOAMS. 1 TO 35 PERCENT SLOPES
712	SONSELA-WASHPASS-VIEWPOINT COMPLEX. 20 TO 70 PERCENT SLOPES
W	WATER

CONVENTIONAL AND SPECIAL
SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

National, state, or province	
Reservation	
County or parish	
Limit of soil survey (label)	
Field sheet matchline and neatline	
STATE COORDINATE TICK 1 890 000 FEET	
ROAD EMBLEM & DESIGNATIONS	
Federal	
State	
County, farm or ranch	

LEVEES

PITS

Gravel pit (2-5 acres)	
Mine or quarry (2-5 acres)	

MISCELLANEOUS WATER FEATURES

Marsh or swamp (2-5 acres)	
Wet spot (2-5 acres)	

SPECIAL SYMBOLS FOR
SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS	
SOIL SAMPLE (normally not shown)	
MISCELLANEOUS	
Gravelly spot (5-10 acres)	
Sodic spot (5-10 acres)	
Spoil area (2-5 acres)	
Rock outcrop (2-5 acres)	
Saline spot (5-10 acres)	
Sandy spot (5-10 acres)	
Seasonal Water Table (2-5 acres)	

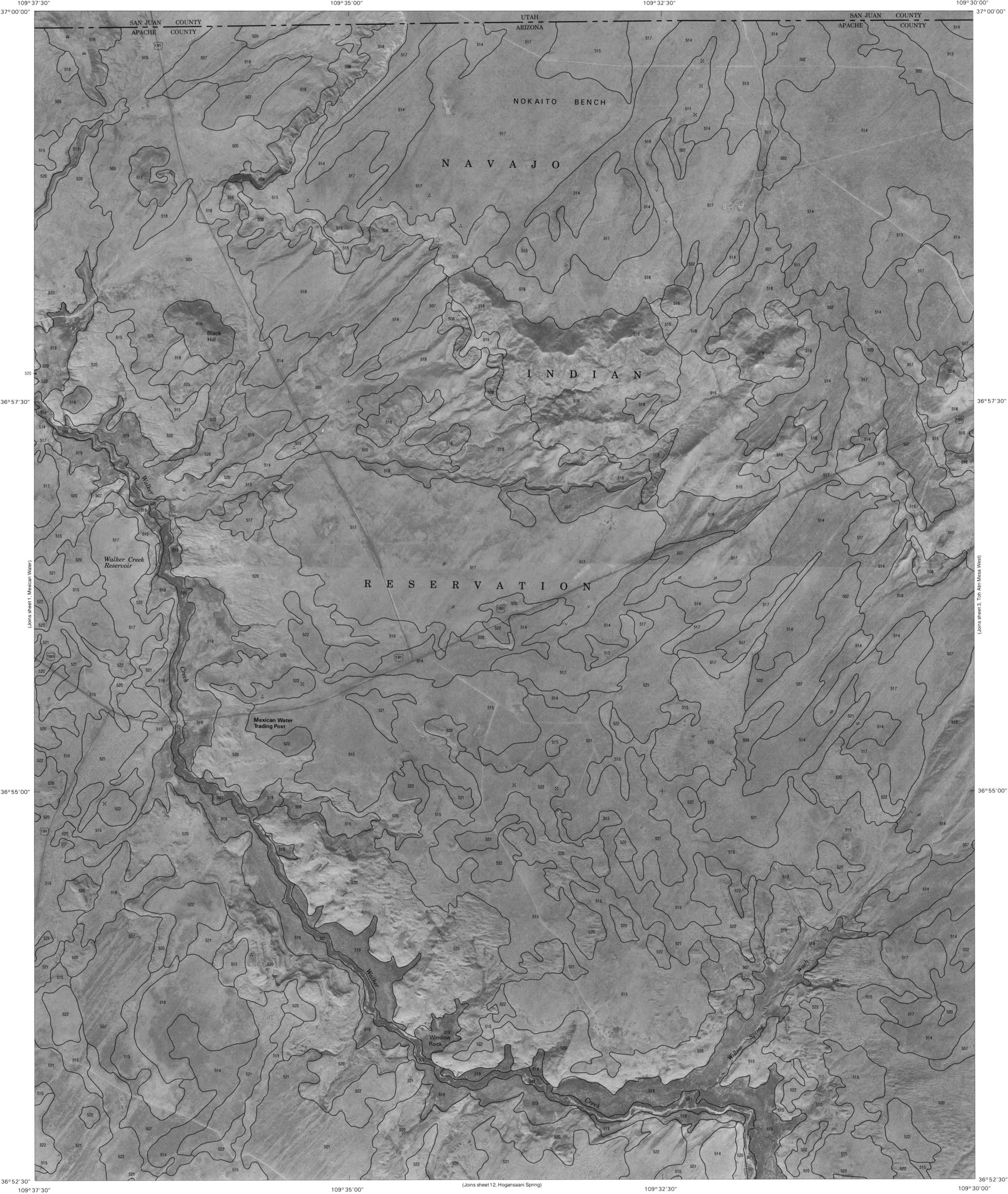


North American Datum of 1983 (NAD83). GRS-80 Spheroid
1000-meter ticks: Universal Transverse Mercator, zone 12.
Coordinate grid ticks and land division data, if shown, are
approximately positioned. Digital data are available for
this quadrangle.

1	2	3	1 MEXICAN HAT SE
			2 MOSES ROCK
			3 BOUNDARY BUTTE
4		5	4 GARNET RIDGE
			5 WALKER CREEK RESERVOIR
			6 DENNEHOTSO
6	7	8	7 MEXICAN WATER SW
			8 HOGANSAANI SPRING

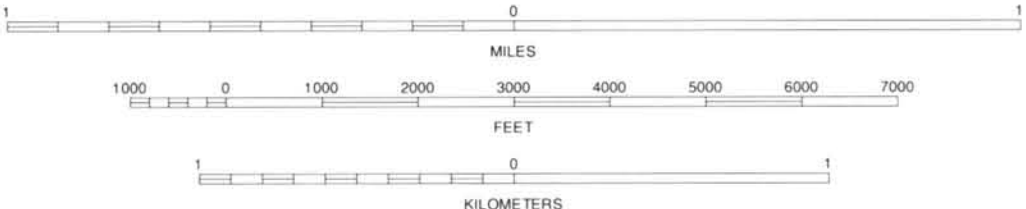
INDEX TO ADJOINING 7.5 MAPS

MEXICAN WATER, ARIZONA
7.5 MINUTE SERIES
SHEET NUMBER 1 OF 65



This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey, from 1992-1998 aerial photography. Public land survey system (PLSS) information was acquired from the Bureau of Land Management.

North American Datum of 1983 (NAD83), GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.



1	2	3
4	5	6
7	8	

INDEX TO ADJOINING 7.5 MAPS



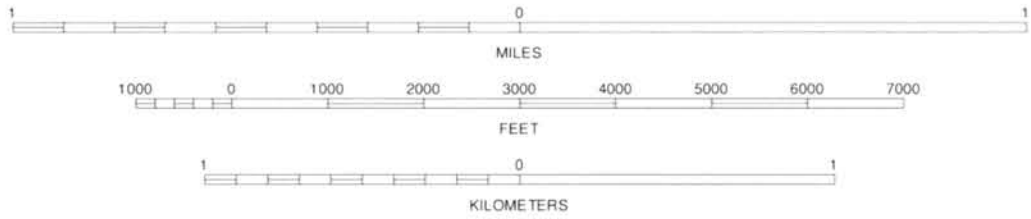
QUADRANGLE LOCATION

WALKER CREEK RESERVOIR, ARIZONA
7.5 MINUTE SERIES
SHEET NUMBER 2 OF 65



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North American Datum of 1983 (NAD83). GRS-80 Spheroid 1000-meter ticks. Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

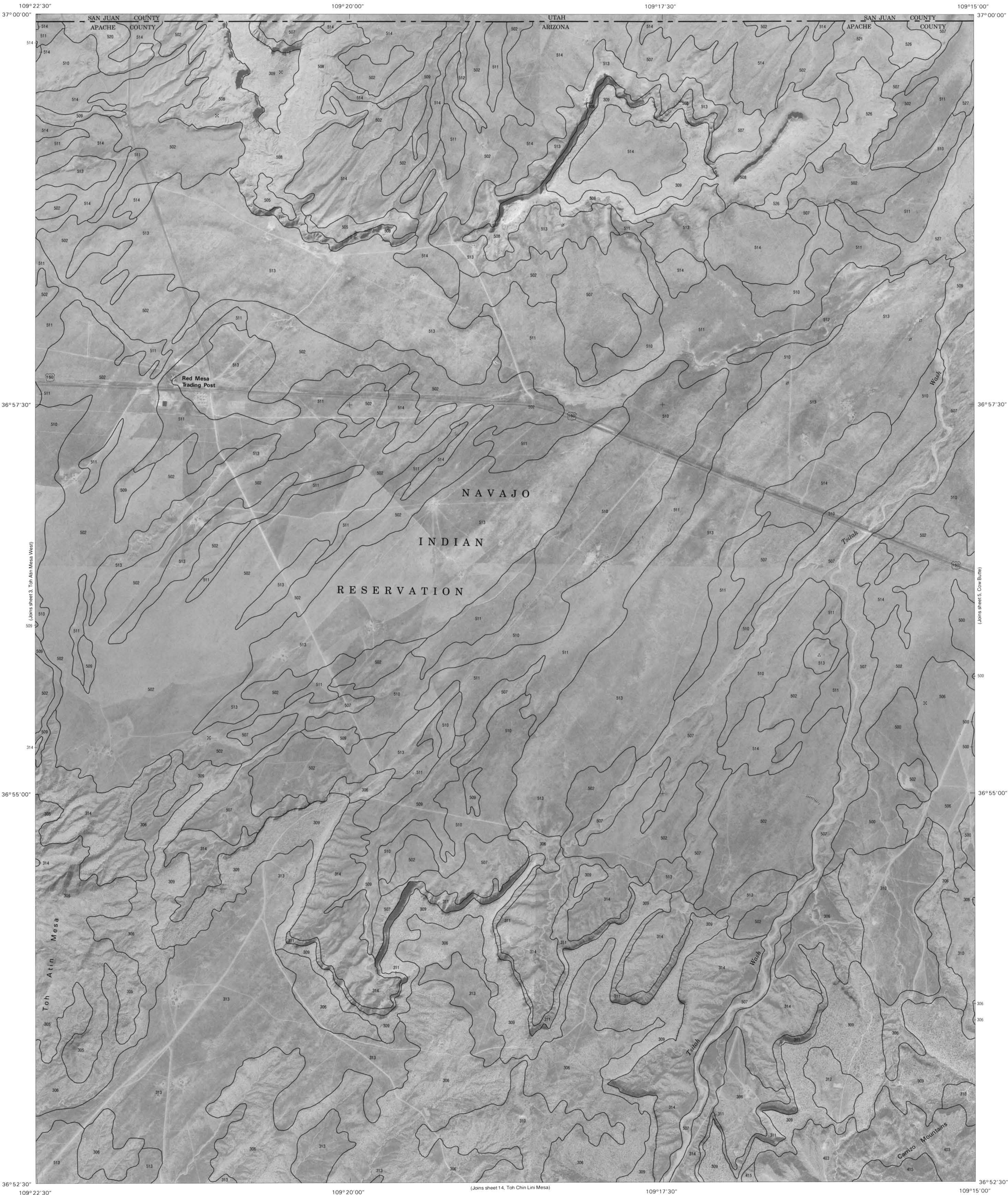


1	2	3	1 BOUNDARY BUTTE
			2 GRAY SPOT ROCK
			3 WHITE MESA VILLAGE SE
4		5	4 WALKER CREEK RESERVOIR
			5 TOH ATIN MESA EAST
			6 HOGANSANI SPRING
6	7	8	7 WALKER BUTTE
			8 TOH CHIN LINI MESA

INDEX TO ADJOINING 7.5 MAPS

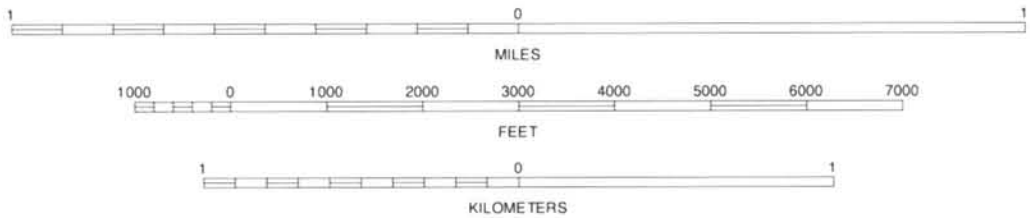


TOH ATIN MESA WEST, ARIZONA
7.5 MINUTE SERIES
SHEET NUMBER 3 OF 65



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North American Datum of 1983 (NAD83), GRS-80 Spheroid
1000-meter ticks: Universal Transverse Mercator, zone 12.
Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.



SHIPROCK AREA, NM & AZ NO. 4

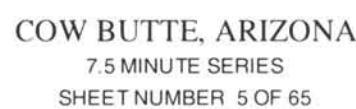
1	2	3	1 GRAY SPOT ROCK
4	5	6	2 WHITE MESA VILLAGE SE
7	8	9	3 YELLOW ROCK POINT WEST
			4 TOH ATIN MESA WEST
			5 COW BUTTE
			6 WALKER BUTTE
			7 TOH CHIN LINI MESA
			8 PASTORA PEAK



QUADRANGLE LOCATION

TOH ATIN MESA EAST, ARIZONA
7.5 MINUTE SERIES
SHEET NUMBER 4 OF 65

SHIPROCK AREA, PARTS OF SAN JUAN COUNTY, NEW MEXICO AND APACHE COUNTY, ARIZONA
COW BUTTE QUADRANGLE
SHEET NUMBER 5 OF 65



SHIPROCK AREA, PARTS OF SAN JUAN COUNTY, NEW MEXICO AND APACHE COUNTY, ARIZONA
TEEC NOS POS QUADRANGLE
SHEET NUMBER 6 OF 65



109°
37° 00' 00"

108° 55' 00"

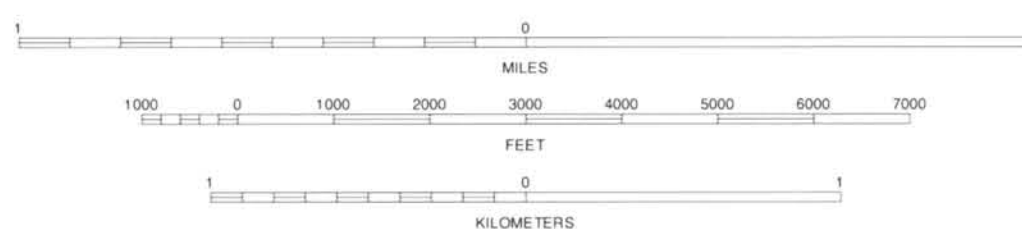
108°52'30"



North American Datum of 1983 (NAD83). GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

North American Datum of 1983 (NAD83). GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

SCALE 1:24000



SHIPROCK AREA, NM & AZ NO. 7

1	2	3	1 ANETH SE
			2 SENTINEL PEAK
			3 SENTINEL PEAK
4		5	4 TEEC NOS POS
			5 CANAL CREEK
6	7	8	6 BECLABITO
			7 ROCKY POINT
			8 RATTLESNAKE

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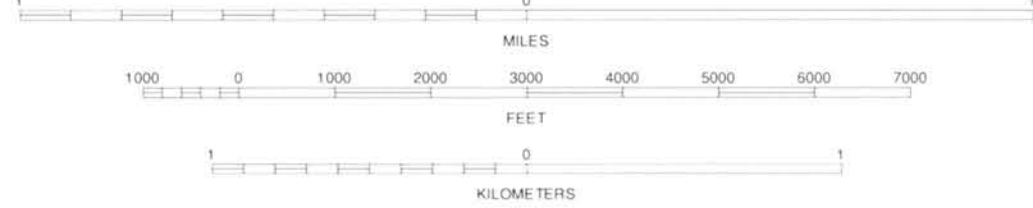
QUADRANGLE LOCATION

SALLIES SPRING, NEW MEXICO
7.5 MINUTE SERIES
SHEET NUMBER 7 OF 65



This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey, from 1992-1998 aerial photography. Public land survey system (PLSS) information was acquired from the Bureau of Land Management.

North American Datum of 1983 (NAD83). GRS-80 Spheroid 1000-meter ticks Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.



1	2	3	1 SENTINEL PEAK SW
4	5	2 SENTINEL PEAK SE	3 TANNER MESA
6	7	4 SALLIES SPRING	5 SKINNEY ROCK
		6 ROCKY POINT	7 RATTLESNAKE
		8 SHIPROCK	

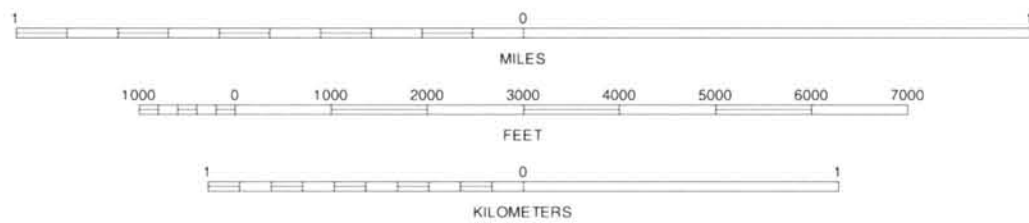


CANAL CREEK, NEW MEXICO
7.5 MINUTE SERIES
SHEET NUMBER 8 OF 65

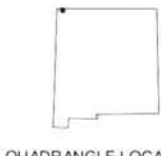


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North American Datum of 1983 (NAD83), GRS-80 Spheroid
1000-meter ticks: Universal Transverse Mercator, zone 12.
Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.



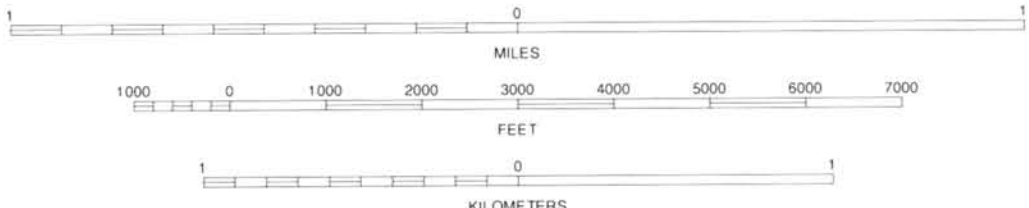
1	2	3	1 SENTINEL PEAK SE
4	5	6	2 TANNER MESA
7	8	9	3 MOQUI CANYON
10	11	12	4 CANAL CREEK
13	14	15	5 PALMER MESA
16	17	18	6 RATTLESNAKE
19	20	21	7 SHIPROCK
22	23	24	8 CHIMNEY ROCK





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North American Datum of 1983 (NAD83), GRS-80 Spheroid 1000-meter ticks Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.



SHIPROCK AREA, NM & AZ NO. 10

1	2	3	1 TANNER MESA
4	5	6	2 MOQUI CANYON
7	8	9	3 GREASEWOOD CANYON
10	11	12	4 SKINNEY ROCK
13	14	15	5 HEIFER POINT
16	17	18	6 SHIPROCK
19	20	21	7 CHIMNEY ROCK
22	23	24	8 WATERFLOW



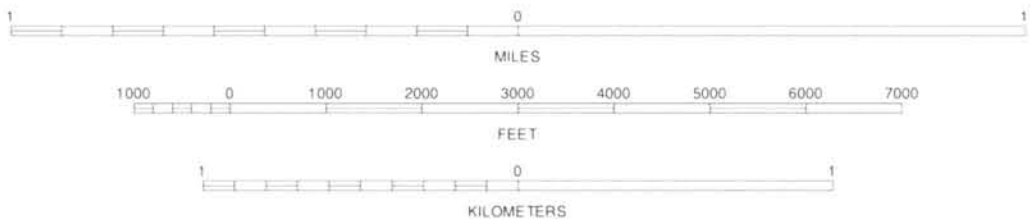
PALMER MESA, NEW MEXICO
7.5 MINUTE SERIES
SHEET NUMBER 10 OF 65



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North American Datum of 1983 (NAD83). GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH



SHIPROCK AREA, NM & AZ NO. 11

1	2	3	1 GARNET RIDGE
			2 MEXICAN WATER
			3 WALKER CREEK RESERVOIR
4		5	4 DENNEHOTSO
			5 HOGANSAANI SPRING
			6 TALL MESA
6	7	8	7 ROCK POINT
			8 DANCING ROCKS

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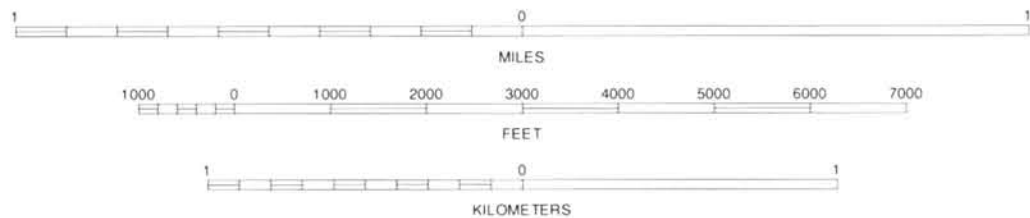
QUADRANGLE LOCATION

MEXICAN WATER SW, ARIZONA
7.5 MINUTE SERIES
SHEET NUMBER 11 OF 65



This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey, from 1992-1998 aerial photography. Public land survey system (PLSS) information was acquired from the Bureau of Land Management.

North American Datum of 1983 (NAD83), GRS-80 Spheroid
1000-meter ticks: Universal Transverse Mercator, zone 12
Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.



SHIPROCK AREA, NM & AZ NO. 12

1	2	3	1 MEXICAN WATER
			2 WALKER CREEK RESE
			3 TOH ATIN MESA WEST
4		5	4 MEXICAN WATER SW
			5 WALKER BUTTE
			6 ROCK POINT
6	7	8	7 DANCING ROCKS
			8 WHITE AREA CANYON

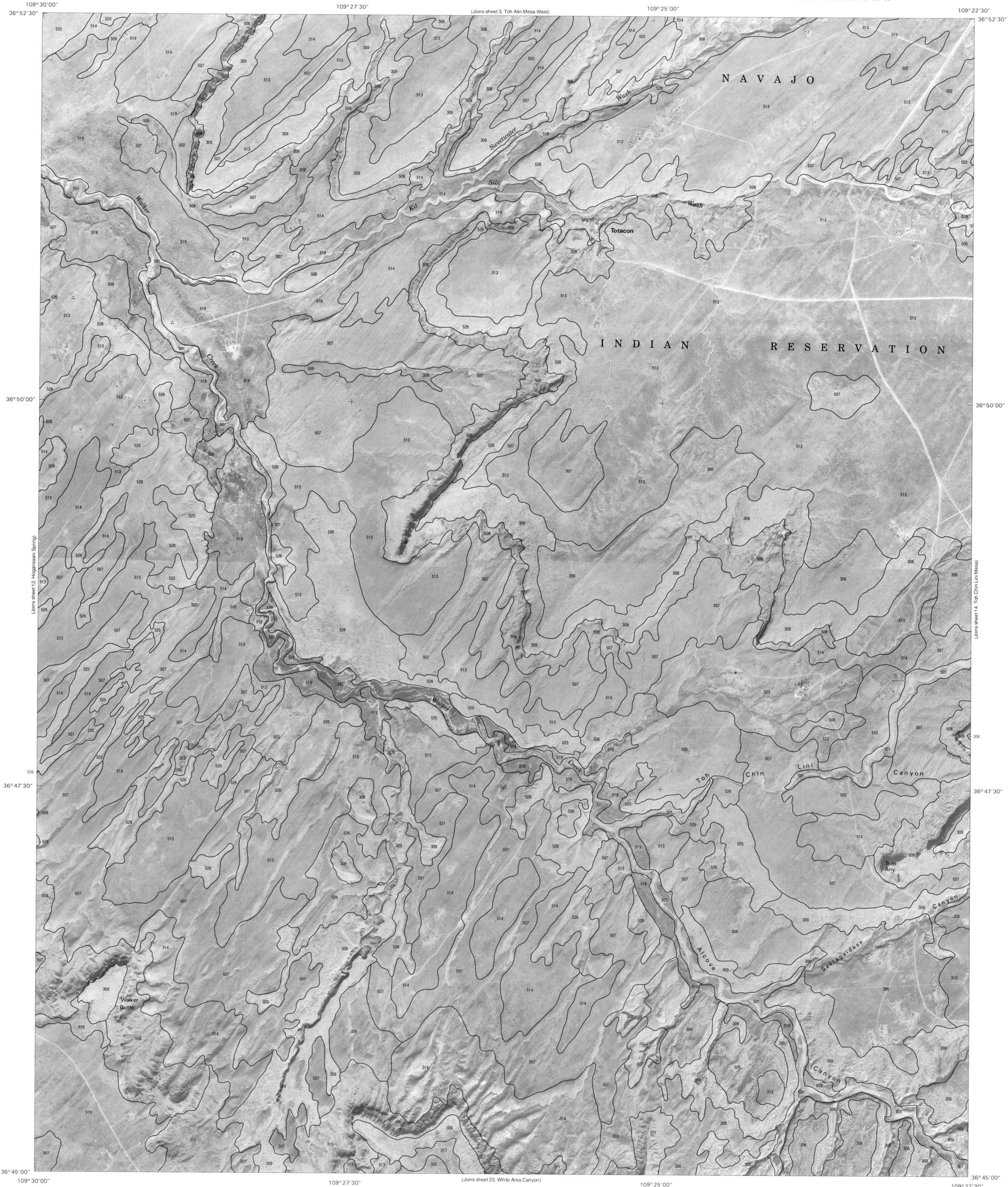
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QUADRANGLE LOCATION

HOGANSAANI SPRING, ARIZONA
7.5 MINUTE SERIES
SHEET NUMBER 12 OF 65

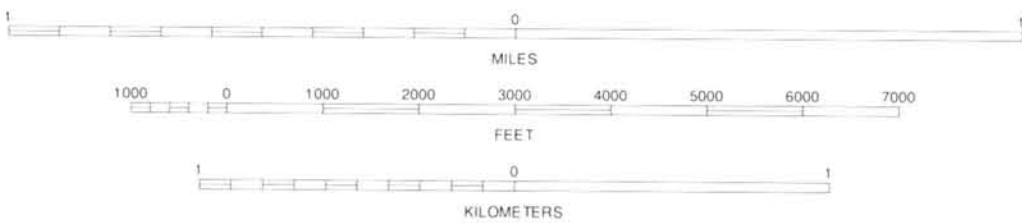


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North American Datum of 1983 (NAD83), GRS-80 Spheroid 1000-meter ticks, Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

SCALE 1:24000



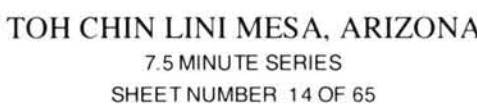
SHIPROCK AREA, NM & AZ NO. 13

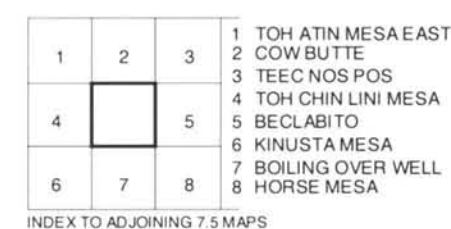
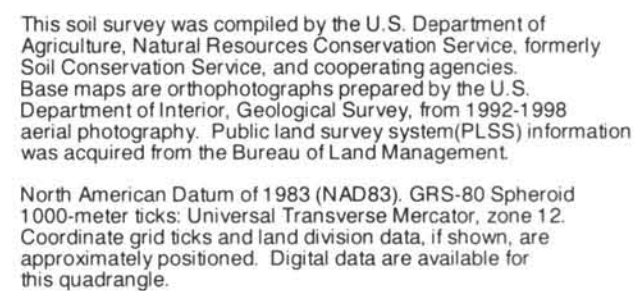
1	2	3	1 WALKER CREEK RESERVOIR
			2 TOH ATIN MESA WEST
			3 TOH ATIN MESA EAST
4		5	4 HOGANSAANI SPRING
			5 TOH CHIN LINI MESA
			6 DANCING ROCKS
6	7	8	7 WHITE AREA CANYON
			8 KINUSTA MESA



WALKER BUTTE, ARIZONA
7.5 MINUTE SERIES
SHEET NUMBER 13 OF 65

SHIPROCK AREA, PARTS OF SAN JUAN COUNTY, NEW MEXICO AND APACHE COUNTY, ARIZONA
TOH CHIN LINI MESA QUADRANGLE
SHEET NUMBER 14 OF 65

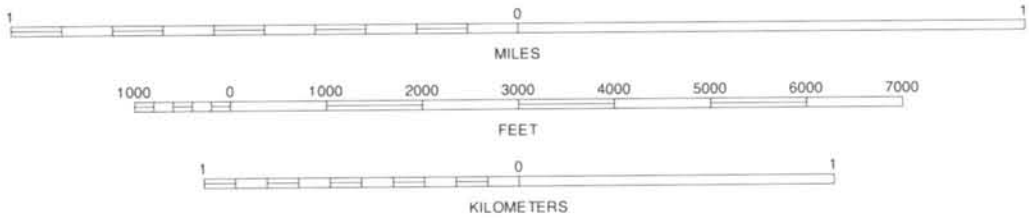






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North American Datum of 1983 (NAD83), GRS-80 Spheroid
1000-meter ticks Universal Transverse Mercator, zone 12
Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.



SHIPROCK AREA, NM & AZ NO. 16

1	2	3	1 COW BUTTE
4	5	2 TEEC NOS POS	3 SALLIES SPRING
6	7	4 PASTOR PEAK	5 ROCKY POINT
		6 BOILING OVER WELL	7 HORSE MESA
		8 SAND SPRING	

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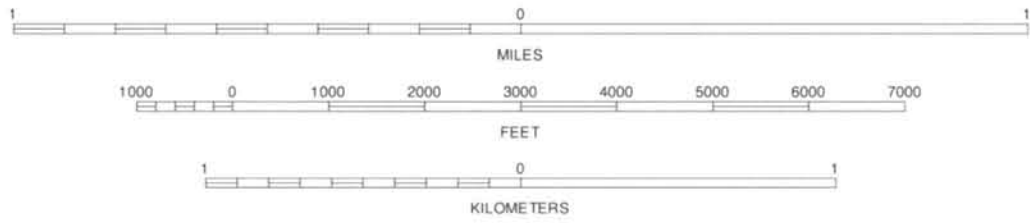
QUADRANGLE LOCATION

BECLABITO, ARIZONA
7.5 MINUTE SERIES
SHEET NUMBER 16 OF 65



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North American Datum of 1983 (NAD83), GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.



SHIPROCK AREA, NM & AZ NO. 17

1	2	3	1 TEEC NOS POS
			2 SALLIES SPRING
			3 CANAL CREEK
4		5	4 BECLABITO
			5 RATTLESNAKE
			6 HORSE MESA
			7 SAND SPRING
6	7	8	8 SHIP ROCK

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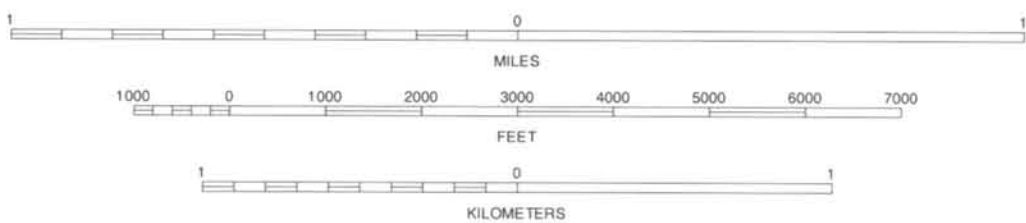
ROCKY POINT, NEW MEXICO
7.5 MINUTE SERIES
SHEET NUMBER 17 OF 65



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North American Datum of 1983 (NAD83). GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH



SHIPROCK AREA, NM & AZ NO. 18

1	2	3	1 SALLIE'S SPRING
			2 CANAL CREEK
			3 SKINNEY ROCK
4		5	4 ROCKY POINT
			5 SHIPROCK
			6 SAND SPRING
6	7	8	7 SHIP ROCK
			8 SULPHUR SPRING

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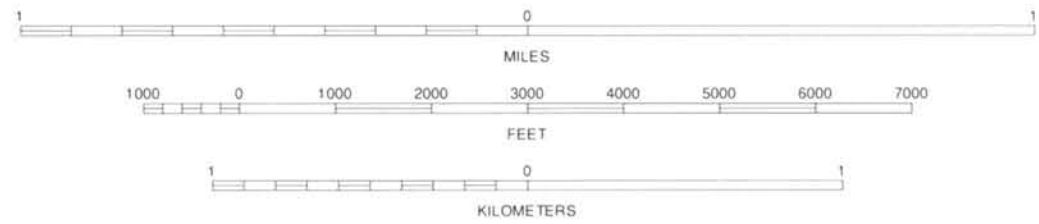
QUADRANGLE LOCATION

RATTLESNAKE, NEW MEXICO
7.5 MINUTE SERIES
SHEET NUMBER 18 OF 65



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North American Datum of 1983 (NAD83). GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.



SHIPROCK AREA, NM & AZ NO. 19

1	2	3	1 CANAL CREEK
			2 SKINNEY ROCK
4		5	3 PALMER MESA
			4 RATTLESNAKE
6	7	8	5 CHIMNEY ROCK
			6 SHIP ROCK
			7 SULPHUR SPRING
			8 THE HOGBACK NORTH

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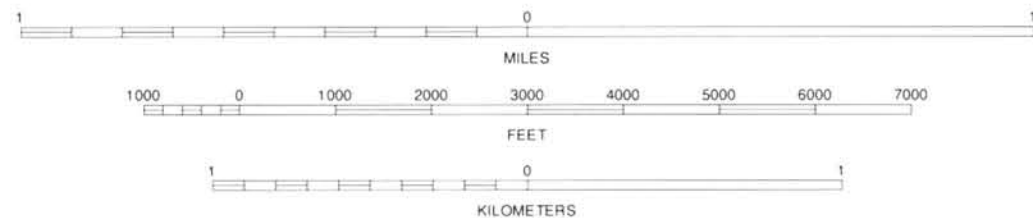
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SHIPROCK, NEW MEXICO
7.5 MINUTE SERIES
SHEET NUMBER 19 OF 65



North American Datum of 1983 (NAD83). GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.



1	2	3	1 SKINNEY ROCK
			2 PALMER MESA
			3 HEIFER POINT
4		5	4 SHIPROCK
			5 WATERFLOW
			6 SULPHUR SPRING
6	7	8	7 THE HOGBACK NORTH
			8 FRUITLAND

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CHIMNEY ROCK, NEW MEXICO
7.5 MINUTE SERIES
SHEET NUMBER 20 OF 65



This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey, from 1992-1998 aerial photography. Public land survey system (PLSS) information was acquired from the Bureau of Land Management.

North American Datum of 1983 (NAD83), GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

1	2	3	1 DENNEHOTSO
4	5	6	2 MEXICAN WATER SW
6	7	8	3 HOGANSAANI SPRING
			4 TALL MESA
			5 DANCING ROCKS
			6 WHITE POINT
			7 ROCK POINT SW
			8 LITTLE ROUND ROCK

QUADRANGLE LOCATION

ROCK POINT, ARIZONA
7.5 MINUTE SERIES
SHEET NUMBER 21 OF 65



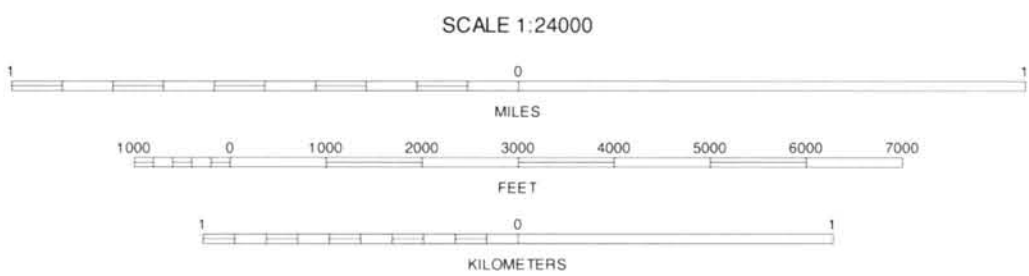
This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey, from 1992-1998 aerial photography. Public land survey system (PLSS) information was acquired from the Bureau of Land Management.

North American Datum of 1983 (NAD83), GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.



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North American Datum of 1983 (NAD83), GRS-80 Spheroid 1000-meter ticks, Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.



1	2	3	1 HOGANSAANI SPRING
4	5	2 WALKER BUTTE	3 TOH CHIN LINI MESA
6	7	4 DANCING ROCKS	5 KINUSTA MESA
		6 LITTLE ROUND ROCK	7 ROUND ROCK
		8 MEXICAN CRY MESA	

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QUADRANGLE LOCATION

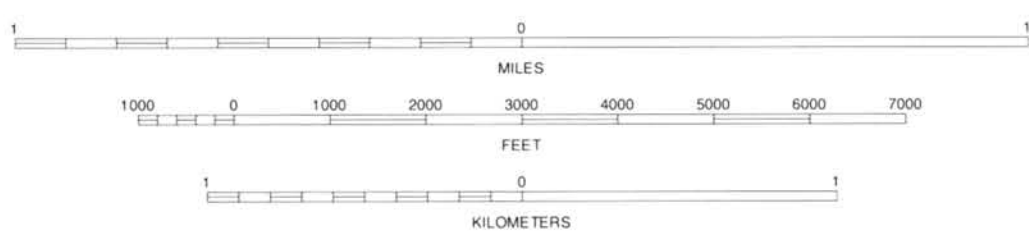
WHITE AREA CANYON, ARIZONA
7.5 MINUTE SERIES
SHEET NUMBER 23 OF 65



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North American Datum of 1983 (NAD83); GRS-80 Spheroid
1000-meter ticks: Universal Transverse Mercator, zone 12.
Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH



SCALE 1:24000

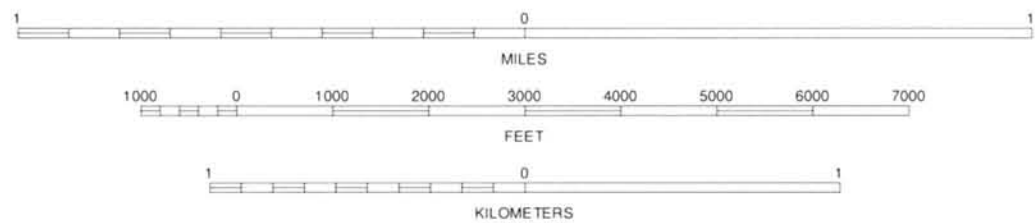
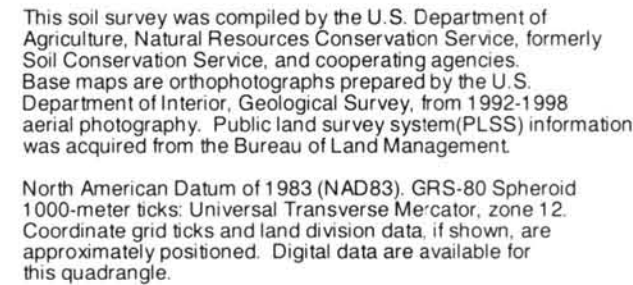
1	2	3	1 WALKER BUTTE
			2 TOH CHIN LINI MESA
			3 PASTORA PEAK
4		5	4 WHITE AREA CANYON
			5 BOILING OVER WELL
			6 ROUND ROCK
6	7	8	7 MEXICAN CRY MESA
			8 COVE

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QUADRANGLE LOCATION

KINUSTA MESA, ARIZONA
7.5 MINUTE SERIES
SHEET NUMBER 24 OF 65



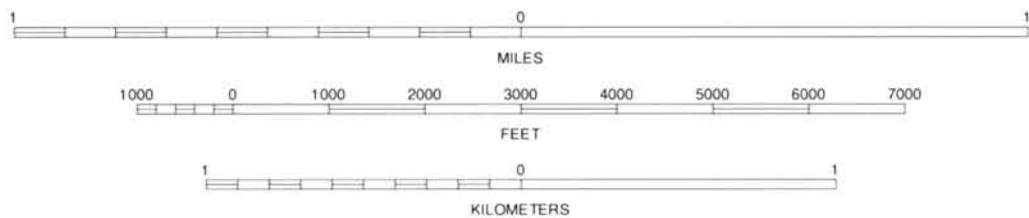


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North American Datum of 1983 (NAD83). GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.



SCALE 1:24000



1	2	3	1 PASTORA PEAK
4	5	6	2 BECLABITO
7	8	9	3 ROCKY POINT
10	11	12	4 BOILING OVER WELL
13	14	15	5 SAND SPRING
16	17	18	6 COVE
19	20	21	7 RED VALLEY
22	23	24	8 MITTEN ROCK

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QUADRANGLE LOCATION

HORSE MESA, ARIZONA
7.5 MINUTE SERIES
SHEET NUMBER 26 OF 65



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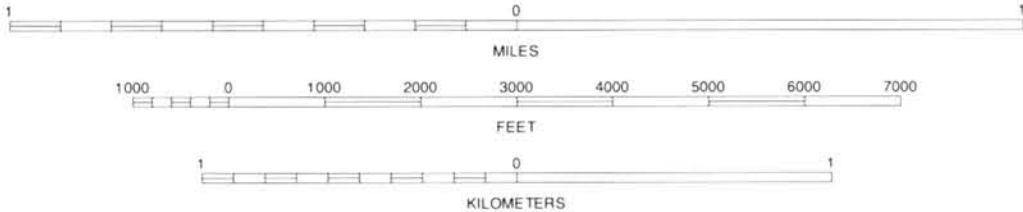
North American Datum of 1983 (NAD83), GRS-80 Spheroid 1000-meter ticks, Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.



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North American Datum of 1983 (NAD83), GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH



SHIPROCK AREA, NM & AZ NO. 28

1	2	3	1 ROCKY POINT
			2 RATTLESNAKE
			3 SHIPROCK
4		5	4 SAND SPRING
			5 SULPHUR SPRING
			6 MITTEN ROCK
6	7	8	7 YELLOW HILL
			8 TABLE MESA

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INDEX TO ADJOINING 7.5 MAPS



QUADRANGLE LOCATION

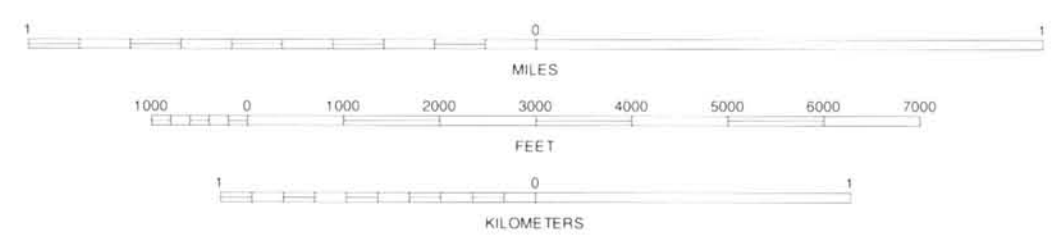
SHIP ROCK, NEW MEXICO
7.5 MINUTE SERIES
SHEET NUMBER 28 OF 65



This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey, from 1992-1998 aerial photography. Public land survey system (PLSS) information was acquired from the Bureau of Land Management.

North American Datum of 1983 (NAD83), GRS-80 Spheroid 1000-meter ticks Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH



SHIPROCK AREA, NM & AZ NO. 29

1	2	3	1 RATTLESNAKE
4	5	2 SHIPROCK	3 CHIMNEY ROCK
6	7	4 SHIP ROCK	5 THE HOGBACK NORTH
		6 YELLOW HILL	7 TABLE MESA
		8 THE HOGBACK SOUTH	

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SULPHUR SPRING, NEW MEXICO
7.5 MINUTE SERIES
SHEET NUMBER 29 OF 65

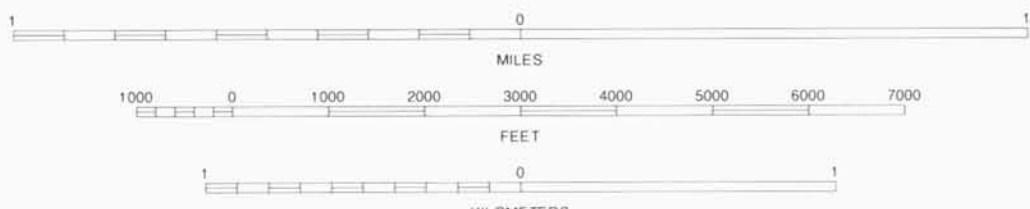


This soil survey was compiled by the U. S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U. S. Department of Interior, Geological Survey, from 1992-1998 aerial photography. Public land survey system (PLSS) information was acquired from the Bureau of Land Management.

North American Datum of 1983 (NAD83), GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

SCALE 1:24000



SHIPROCK AREA, NM & AZ NO. 30

1	2	3	1 SHIPROCK
4	5	6	2 CHIMNEY ROCK
7	8	9	3 WATERFLOW
10	11	12	4 SULPHUR SPRING
13	14	15	5 FRUITLAND
16	17	18	6 TABLE MESA
19	20	21	7 THE HOGBACK SOUTH
22	23	24	8 KIRTLAND SW

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QUADRANGLE LOCATION

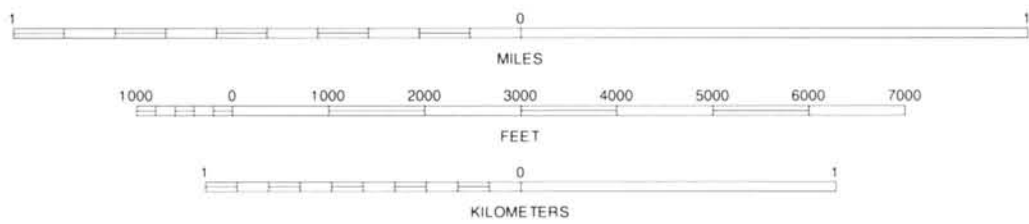
THE HOGBACK NORTH, NEW MEXICO
7.5 MINUTE SERIES
SHEET NUMBER 30 OF 65



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North American Datum of 1983 (NAD83), GRS-80 Spheroid 1000-meter ticks, Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH



1	2	3	1 RED POINT MESA
4	5	2 TALL MESA	2 TALL MESA
6	7	3 ROCK POINT	3 ROCK POINT
8	8	4 SWEETWATER MESA	4 SWEETWATER MESA
		5 ROCK POINT SW	5 ROCK POINT SW
		6 ROCK POINT NW	6 ROCK POINT NW
		7 ROUGH ROCK	7 ROUGH ROCK
		8 WINDY VALLEY	8 WINDY VALLEY

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QUADRANGLE LOCATION

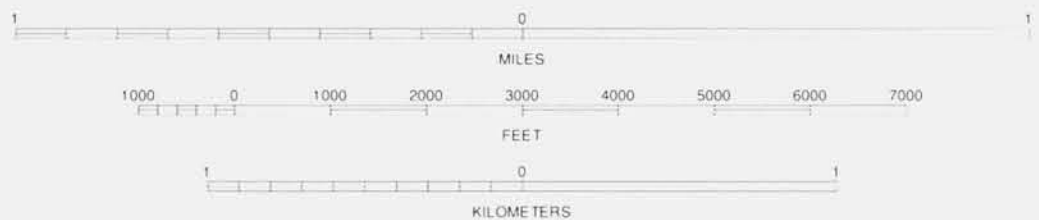
WHITE POINT, ARIZONA
7.5 MINUTE SERIES
SHEET NUMBER 31 OF 65



This soil survey was compiled by the U. S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U. S. Department of Interior, Geological Survey, from 1992-1998 aerial photography. Public land survey system (PLSS) information was acquired from the Bureau of Land Management.

North American Datum of 1983 (NAD83), GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH



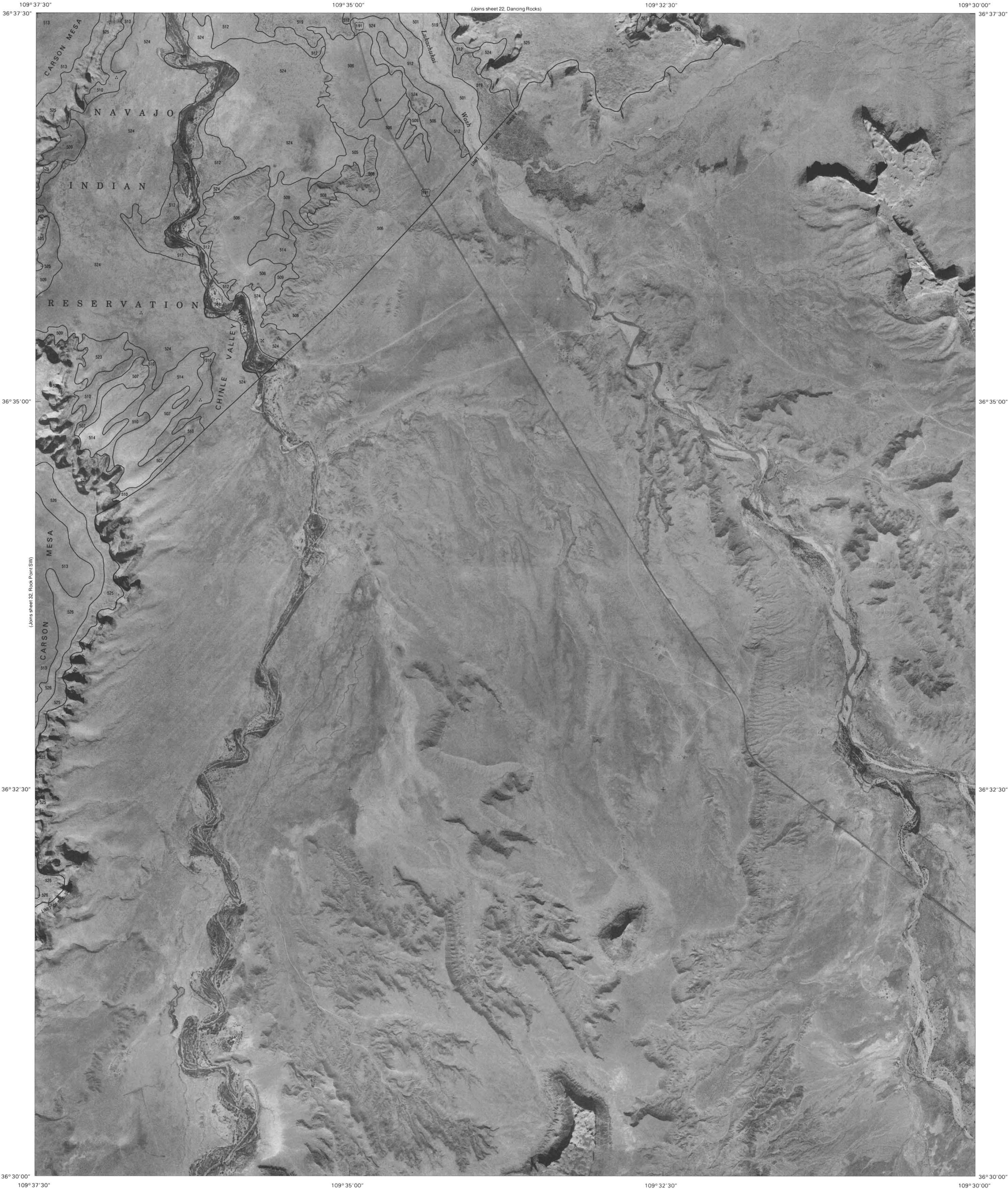
1	2	3	1 TALL MESA
4	5	2 ROCK POINT	
6	7	3 DANCING ROCKS	
		4 WHITE POINT	
		5 LITTLE ROUND ROCK	
		6 ROUGH ROCK	
		7 WINDY VALLEY	
		8 MANY FARMS NE	

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QUADRANGLE LOCATION

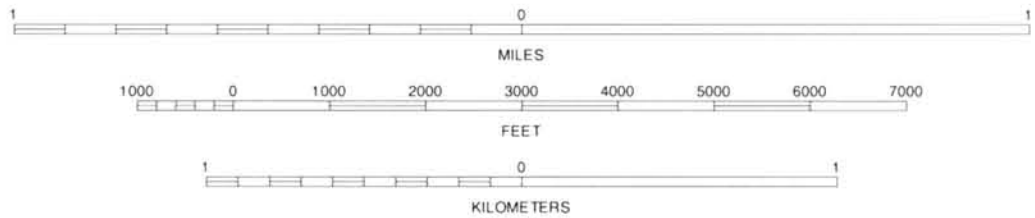
ROCK POINT SW, ARIZONA
7.5 MINUTE SERIES
SHEET NUMBER 32 OF 65



This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey, from 1982-1998 aerial photography. Public land survey system (PLSS) information was acquired from the Bureau of Land Management.

North American Datum of 1983 (NAD83), GRS-80 Spheroid 1000-meter ticks; Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

SCALE 1:24000



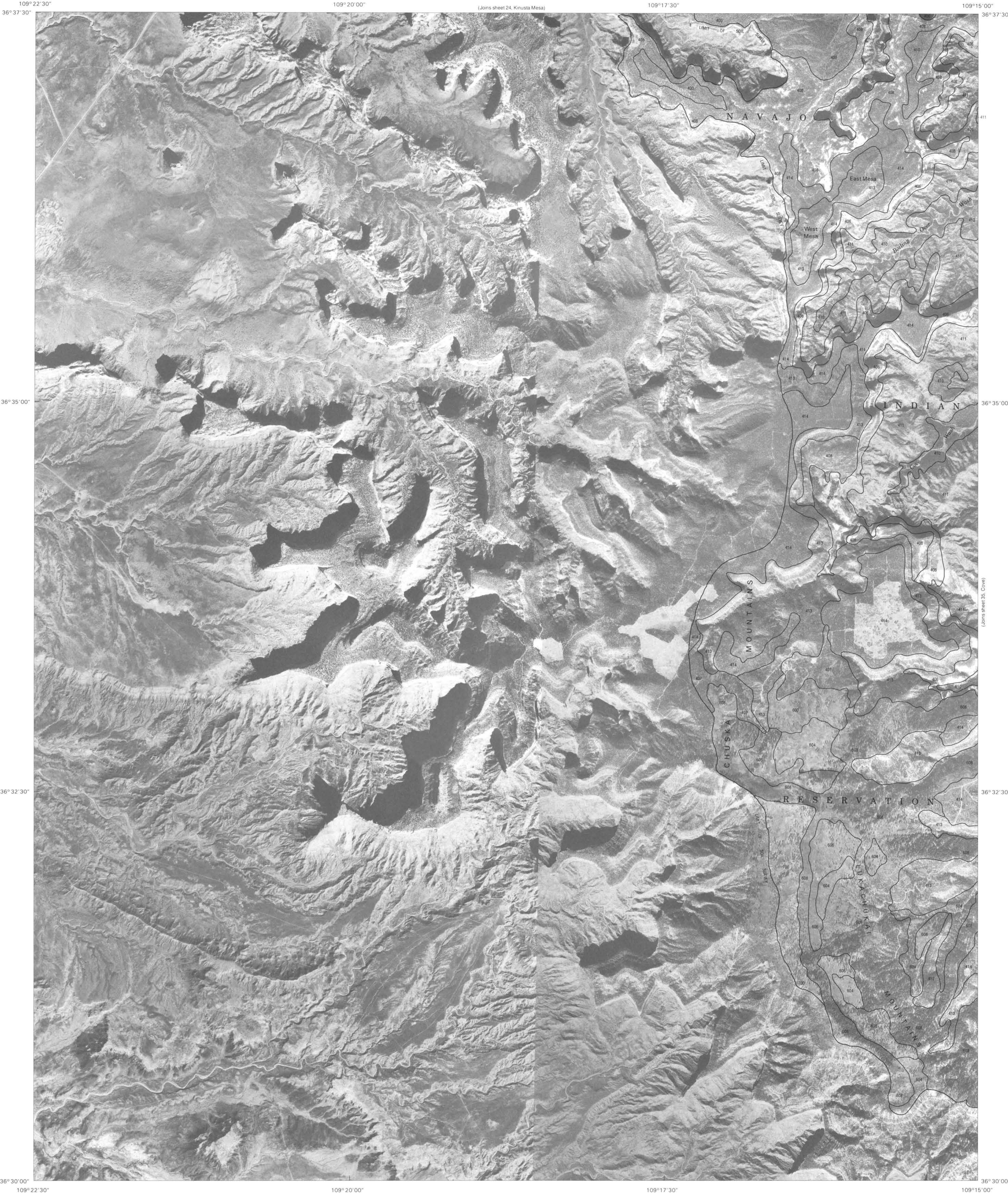
1	2	3	1 ROCK POINT
			2 DANCING ROCKS
			3 WHITE AREA CANYON
4		5	4 ROCK POINT SW
			5 ROUND ROCK
			6 WINDY VALLEY
			7 MANY FARMS NE
6	7	8	8 FIRE DANCE MESA

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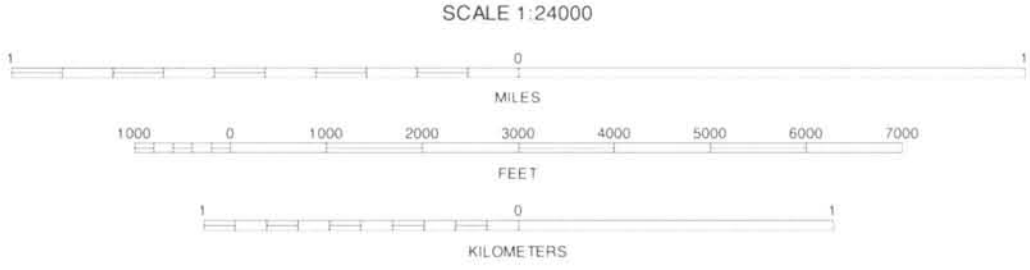
QUADRANGLE LOCATION

LITTLE ROUND ROCK, ARIZONA
7.5 MINUTE SERIES
SHEET NUMBER 33 OF 65



This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey, from 1992-1998 aerial photography. Public land survey system (PLSS) information was acquired from the Bureau of Land Management.

North American Datum of 1983 (NAD83). GRS-80 Spheroid 1000-meter ticks. Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.



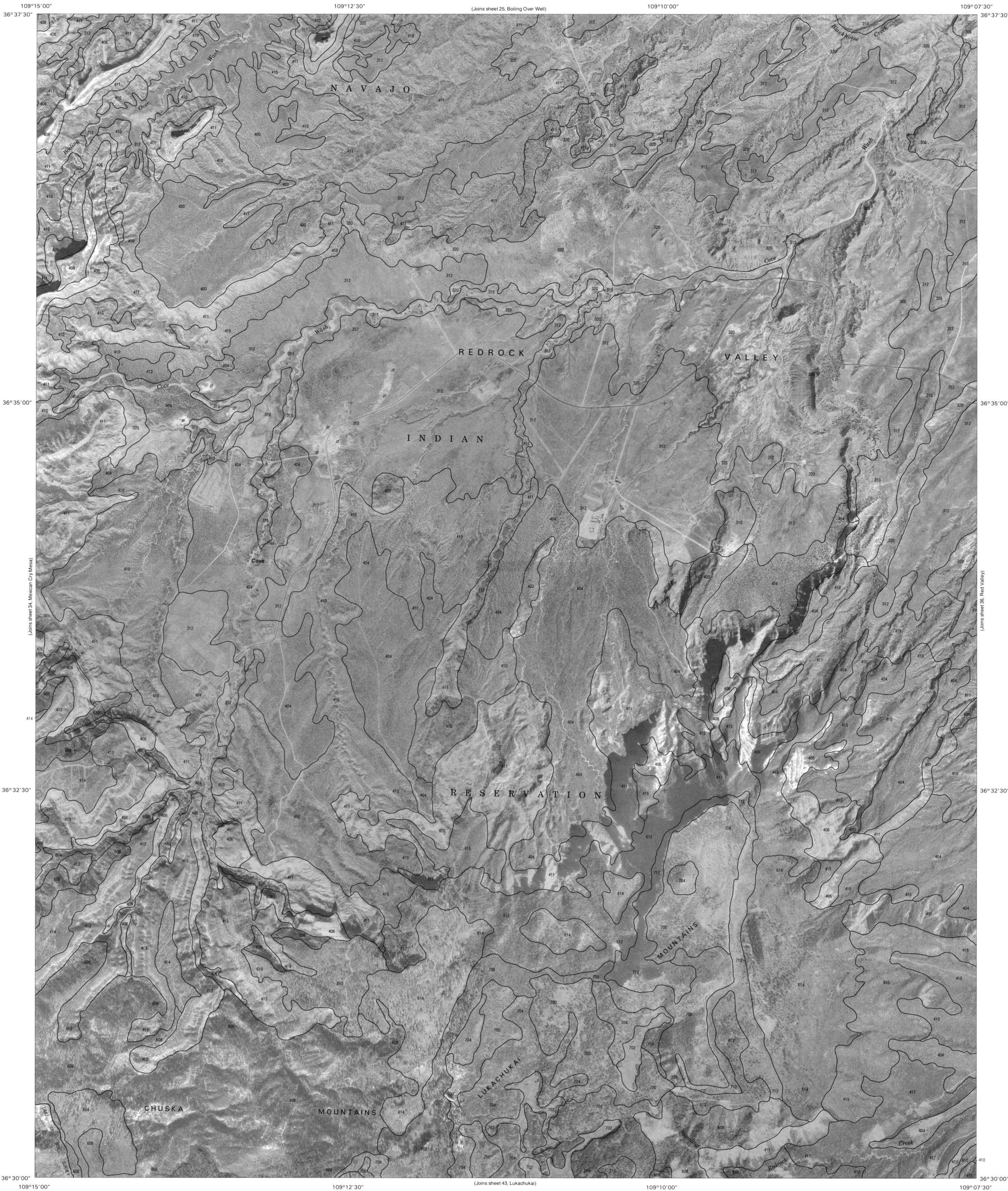
1	2	3	1	WHITE AREA CANYON
4	5	6	2	KINUSTA MESA
7	8	9	3	BOILING OVER WELL
10	11	12	4	ROUND ROCK
13	14	15	5	COVE
16	17	18	6	FIRE DANCE MESA
19	20	21	7	BAD BUG BUTTE
22	23	24	8	LUKACHUKAI

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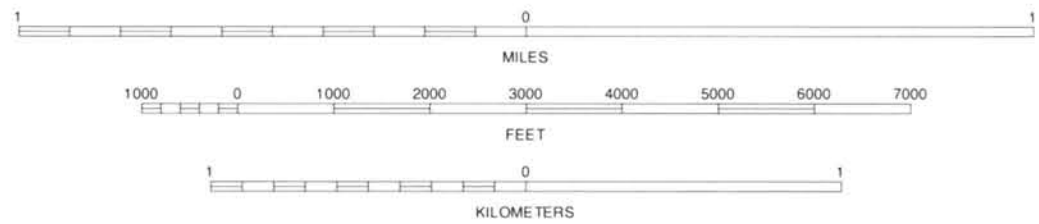
QUADRANGLE LOCATION

MEXICAN CRY MESA, ARIZONA
7.5 MINUTE SERIES
SHEET NUMBER 34 OF 65



This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey, from 1992-1998 aerial photography. Public land survey system (PLSS) information was acquired from the Bureau of Land Management.

North American Datum of 1983 (NAD83), GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.



SHIPROCK AREA, NM & AZ NO. 35

1	2	3	1 KINUSTAMESA
			2 BOILING OVER WELL
			3 HORSE MESA
4		5	4 MEXICAN CRYMESA
			5 RED VALLEY
			6 BAD BUG BUTTE
6	7	8	7 LUKACHUKAI
			8 ROOF BUTTE

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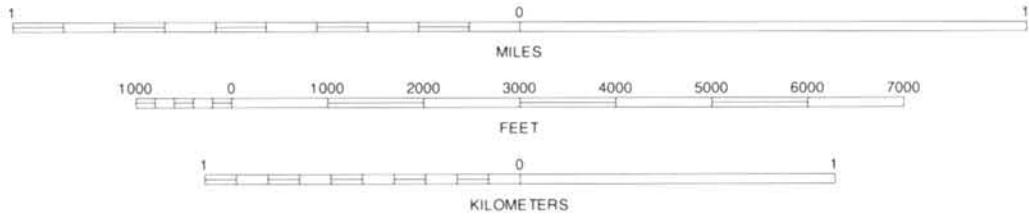
QUADRANGLE LOCATION

COVE, ARIZONA
7.5 MINUTE SERIES
SHEET NUMBER 35 OF 65



This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey, from 1992-1998 aerial photography. Public land survey system (PLSS) information was acquired from the Bureau of Land Management.

North American Datum of 1983 (NAD83) GRS-80 Spheroid
1000-meter ticks: Universal Transverse Mercator, zone 12
Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.



1	2	3	1 BOILING OVER WE
			2 HORSE MESA
4		5	3 SAND SPRING
			4 COVE
			5 MITTEN ROCK
6	7	8	6 LUKACHUKAI
			7 ROOF BUTTE
			8 SANOSTEE WEST

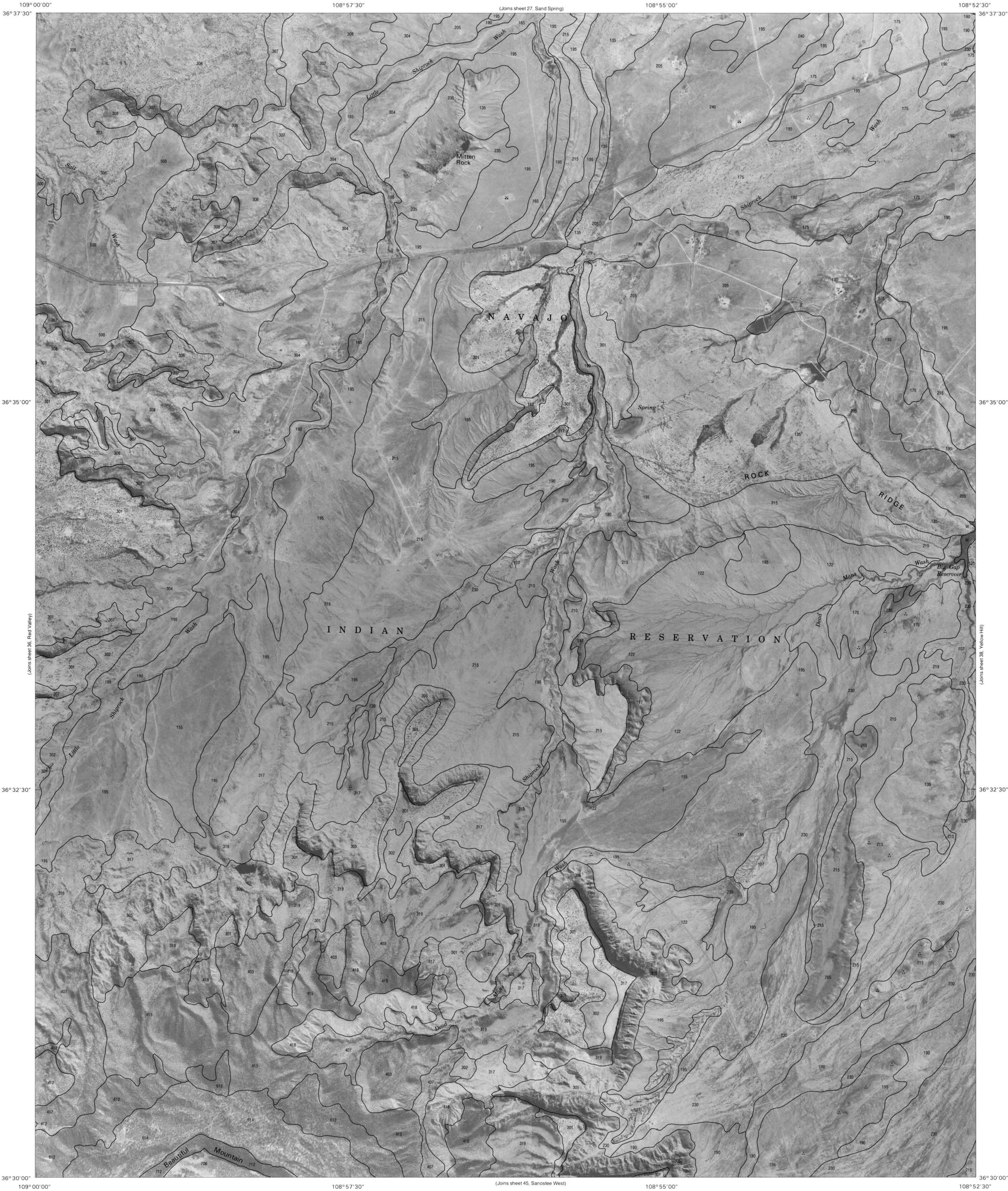
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QUADRANGLE LOCATION

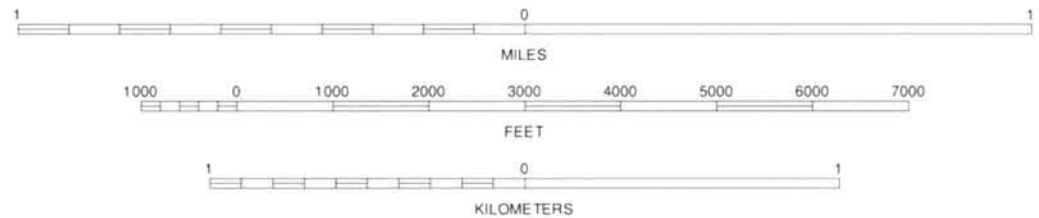
RED VALLEY, ARIZONA
7.5 MINUTE SERIES
SHEET NUMBER 36 OF 65



This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey, from 1992-1998 aerial photography. Public land survey system (PLSS) information was acquired from the Bureau of Land Management.

North American Datum of 1983 (NAD83), GRS-80 Spheroid
1000-meter ticks: Universal Transverse Mercator, zone 12.
Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH



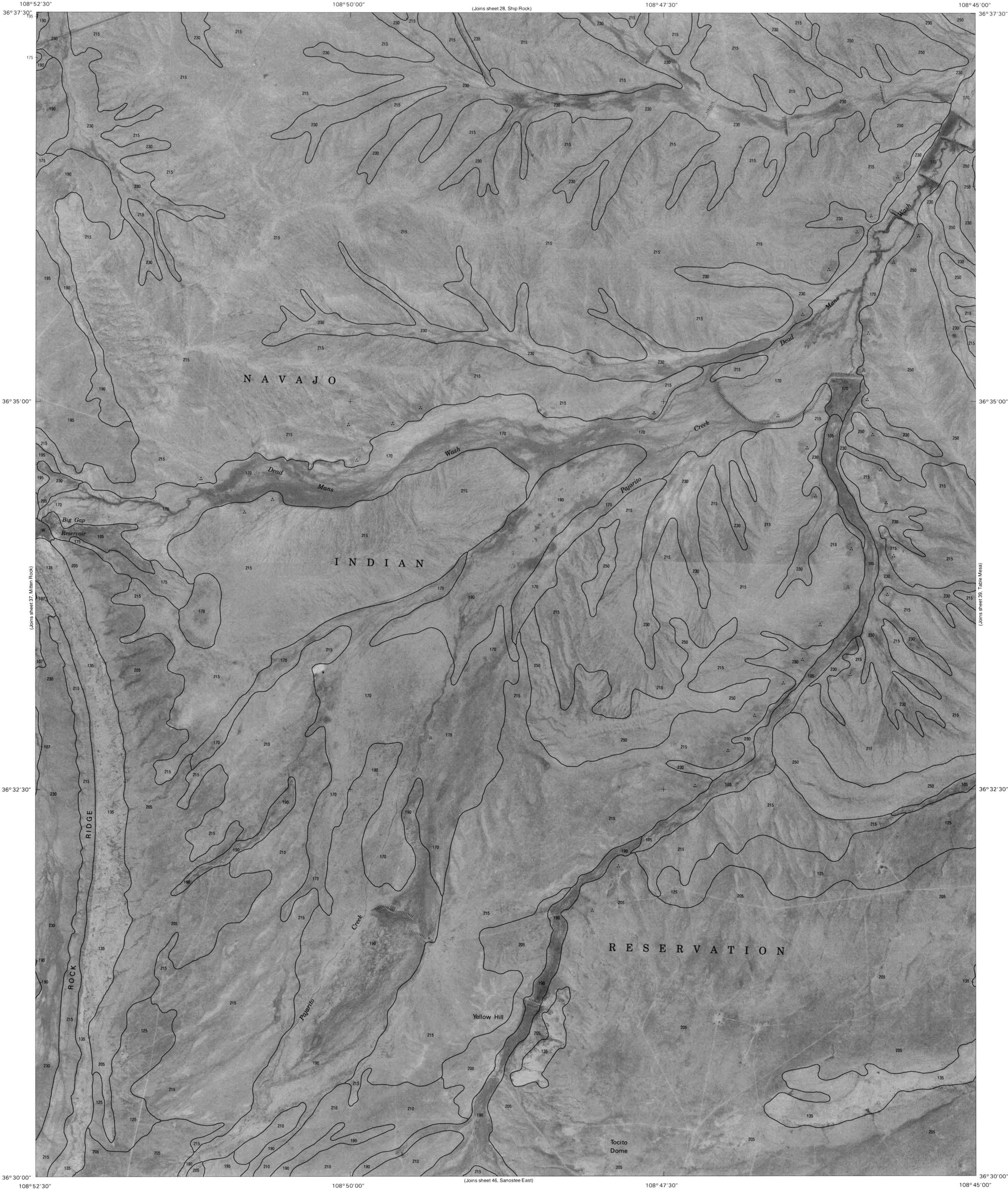
SHIPROCK AREA, NM & AZ NO. 37

1	2	3	1 HORSE MESA
4	5	2 SAND SPRING	
6	7	3 SHIP ROCK	
		4 RED VALLEY	
		5 YELLOW HILL	
		6 ROOF BUTTE	
		7 SANOSTEE WEST	
		8 SANOSTEE EAST	

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MITTEN ROCK, NEW MEXICO
7.5 MINUTE SERIES
SHEET NUMBER 37 OF 65

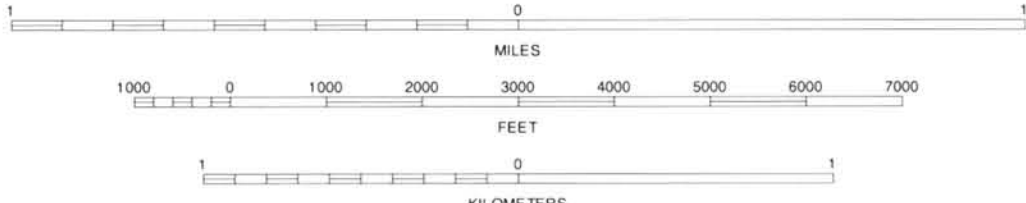


This soil survey was compiled by the U. S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U. S. Department of Interior, Geological Survey, from 1952-1998 aerial photography. Public land survey system (PLSS) information was acquired from the Bureau of Land Management.

North American Datum of 1983 (NAD83), GRS-80 Spheroid 1000-meter ticks, Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

SCALE 1:24000



1	2	3	1 SAND SPRING
			2 SHIP ROCK
			3 SULPHUR SPRING
4		5	4 MITTEN ROCK
			5 TABLE MESA
			6 SANOSTEE WEST
6	7	8	7 SANOSTEE EAST
			8 LITTLE WATER

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QUADRANGLE LOCATION

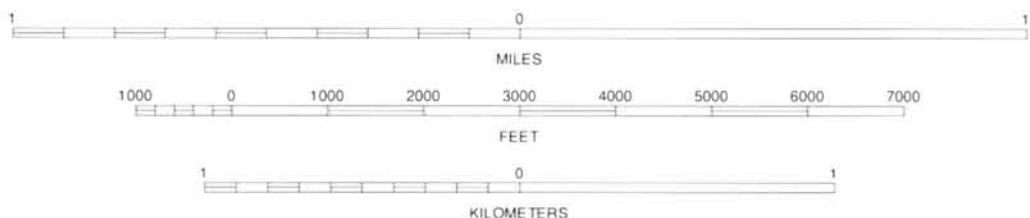
YELLOW HILL, NEW MEXICO
7.5 MINUTE SERIES
SHEET NUMBER 38 OF 65



This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey, from 1992-1998 aerial photography. Public land survey system (PLSS) information was acquired from the Bureau of Land Management.

North American Datum of 1983 (NAD83), GRS-80 Spheroid 1000-meter ticks, Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH



SHIPROCK AREA, NM & AZ NO. 39

1	2	3	1 SHIP ROCK
			2 SULPHUR SPRING
4		5	3 THE HOGBACK NORTH
			4 YELLOW HILL
			5 THE HOGBACK SOUTH
6	7	8	6 SANOSTEE EAST
			7 LITTLE WATER
			8 NEWCOMBE NE

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QUADRANGLE LOCATION

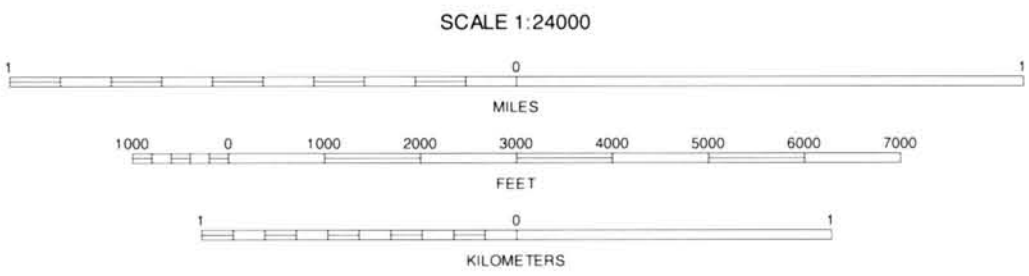
TABLE MESA, NEW MEXICO
7.5 MINUTE SERIES
SHEET NUMBER 39 OF 65



This soil survey was compiled by the U. S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U. S. Department of Interior, Geological Survey, from 1992-1998 aerial photography. Public land survey system (PLSS) information was acquired from the Bureau of Land Management.

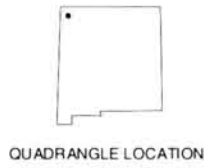
North American Datum of 1983 (NAD83). GRS-80 Spheroid 1000-meter ticks. Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH



1	2	3	1 SULPHUR SPRING
			2 THE HOGBACK NORTH
			3 FRUITLAND
			4 TABLE MESA
4		5	5 KIRTLAND SW
			6 LITTLE WATER
			7 NEWCOMB NE
6	7	8	8 THE PILLAR NW

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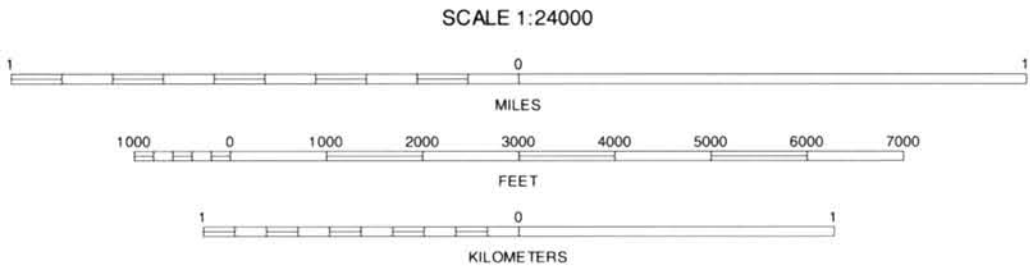


THE HOGBACK SOUTH, NEW MEXICO
7.5 MINUTE SERIES
SHEET NUMBER 40 OF 65



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North American Datum of 1983 (NAD83), GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.



1	2	3	1 SWEETWATER MESA
			2 WHITE POINT
			3 ROCK POINT SW
4		5	4 ROUGH ROCK NW
			5 WINDY VALLEY
			6 TAH CHEE WASH
			7 SWEATHOUSE PEAK
6	7	8	8 MANY FARMS SW

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QUADRANGLE LOCATION

ROUGH ROCK, ARIZONA
7.5 MINUTE SERIES
SHEET NUMBER 41 OF 65

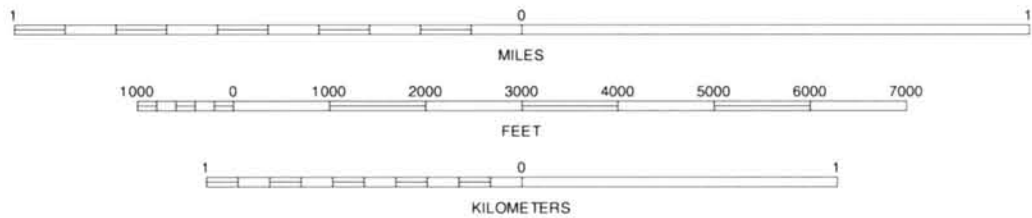


This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey, from 1982-1998 aerial photography. Public land survey system (PLSS) information was acquired from the Bureau of Land Management.

North American Datum of 1983 (NAD83), GRS-80 Spheroid
1000-meter ticks: Universal Transverse Mercator, zone 12.
Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

SCALE 1:24000



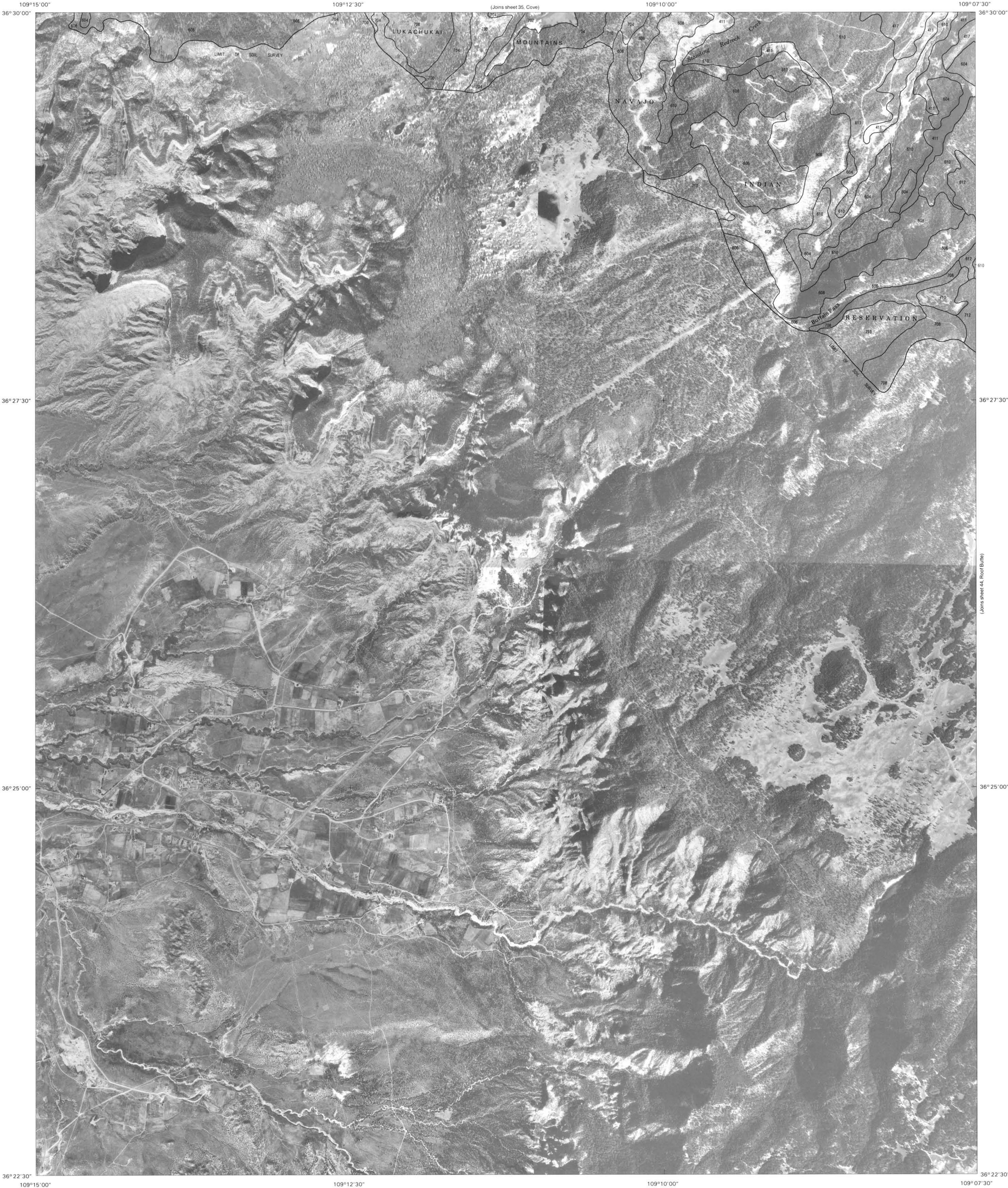
1	2	3	1 WHITE POINT
			2 ROCK POINT SW
			3 LITTLE ROUND ROCK
4		5	4 ROUGH ROCK
			5 MANY FARMS NE
			6 SWEATHOUSE PEAK
6	7	8	7 MANY FARMS SW
			8 MANY FARMS

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QUADRANGLE LOCATION

WINDY VALLEY, ARIZONA
7.5 MINUTE SERIES
SHEET NUMBER 42 OF 65

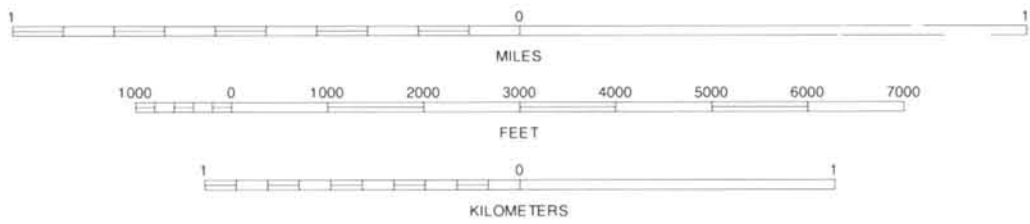


This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey, from 1992-1998 aerial photography. Public land survey system (PLSS) information was acquired from the Bureau of Land Management.

North American Datum of 1983 (NAD83). GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH

SCALE 1:24000



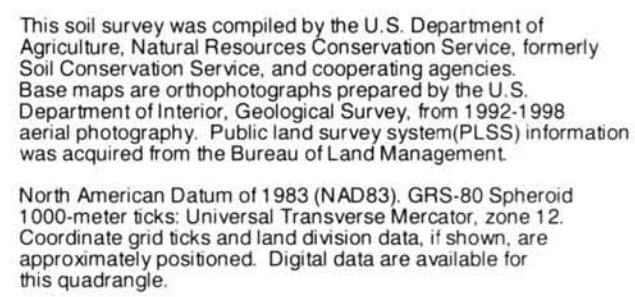
1	2	3	1 MEXICAN CRY MESA
			2 COVE
			3 RED VALLEY
4		5	4 BAD BUG BUTTE
			5 ROOF BUTTE
			6 RED CORNFIELD MESA
			7 TSAILE
6	7	8	8 TSAILE BUTTE

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QUADRANGLE LOCATION

LUKACHUKAI, ARIZONA
7.5 MINUTE SERIES
SHEET NUMBER 43 OF 65



1	2	3	1 COVE
			2 RED VALLEY
			3 MITTEN ROCK
4		5	4 LUKACHUKAI
			5 SANOSTEE WEST
			6 TSAILE
6	7	8	7 TSAILE BUTTE
			8 OLD PINE SPRING

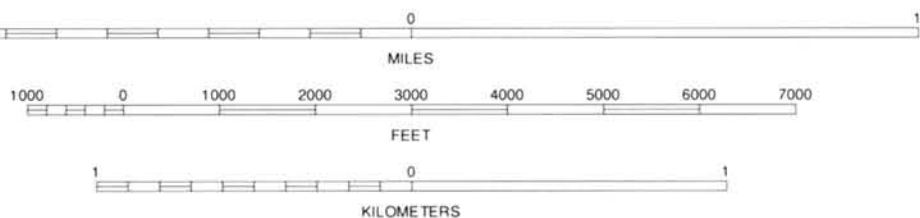
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ROOF BUTTE, ARIZONA
7.5 MINUTE SERIES
SHEET NUMBER 44 OF 65



This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey, from 1992-1998 aerial photography. Public land survey system (PLSS) information was acquired from the Bureau of Land Management.

North American Datum of 1983 (NAD83), GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.



SHIPROCK AREA, NM & AZ NO. 46

1	2	3	1 MITTEN ROCK
			2 YELLOW HILL
4		5	3 TABLE MESA
			4 SANOSTEE WEST
6	7	8	5 LITTLE WATER
			6 OLD PINE SPRING
			7 TSIN-NAS-KID
			8 NEWCOMB

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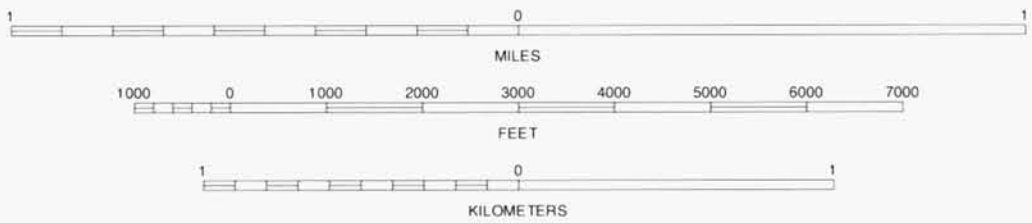
QUADRANGLE LOCATION

SANOSTEE EAST, NEW MEXICO
7.5 MINUTE SERIES
SHEET NUMBER 46 OF 65



This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey, from 1952-1958 aerial photography. Public land survey system (PLSS) information was acquired from the Bureau of Land Management.

North American Datum of 1983 (NAD83). GRS-80 Spheroid 1000-meter ticks. Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.



SHIPROCK AREA, NM & AZ NO. 47

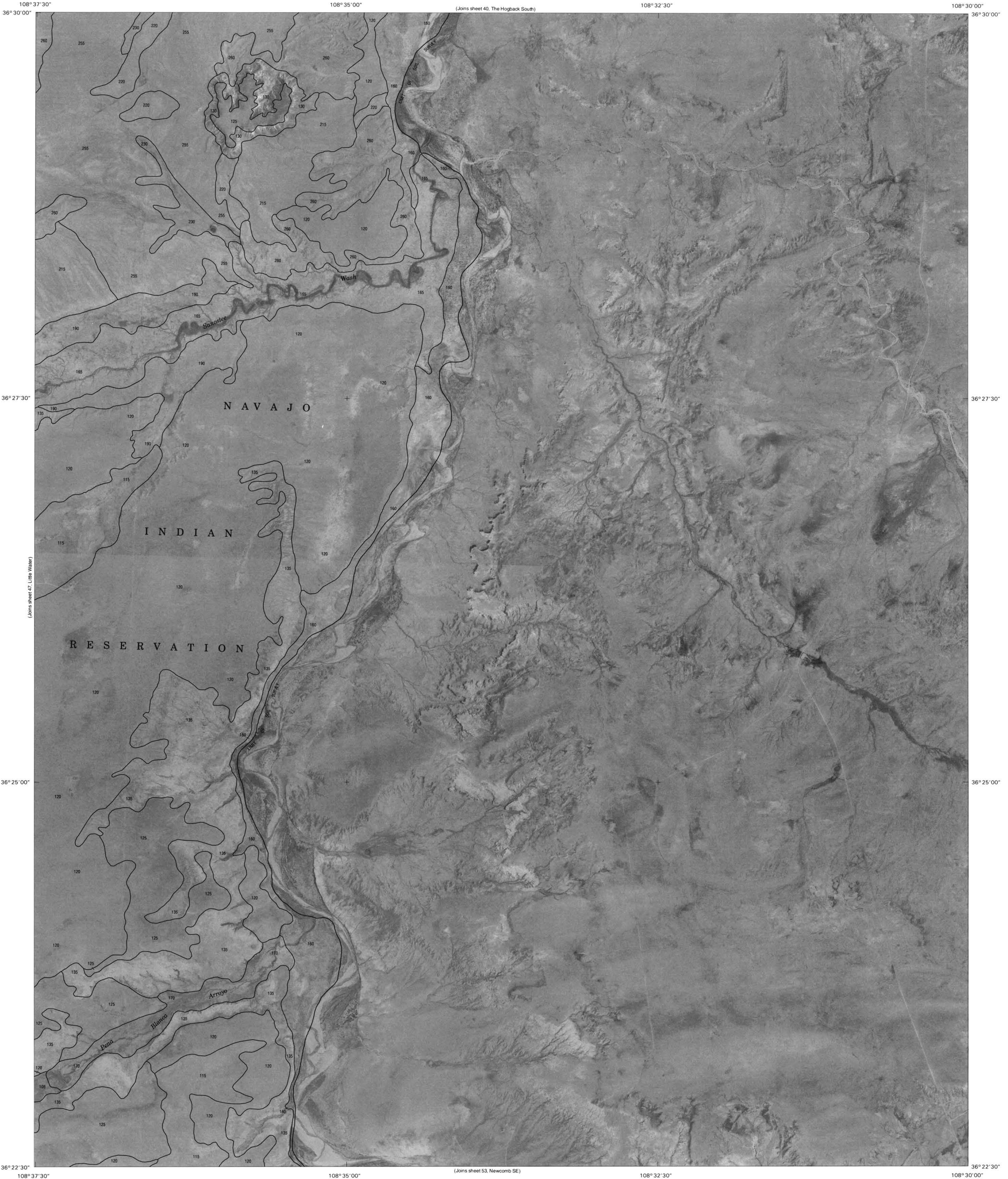
1	2	3	1 YELLOW HILL
4	5	6	2 TABLE MESA
6	7	8	3 THE HOGBACK SOUTH
			4 SANOSTEE EAST
			5 NEWCOMB NE
			6 TSIN-NAS KID
			7 NEWCOMB
			8 NEWCOMB SE

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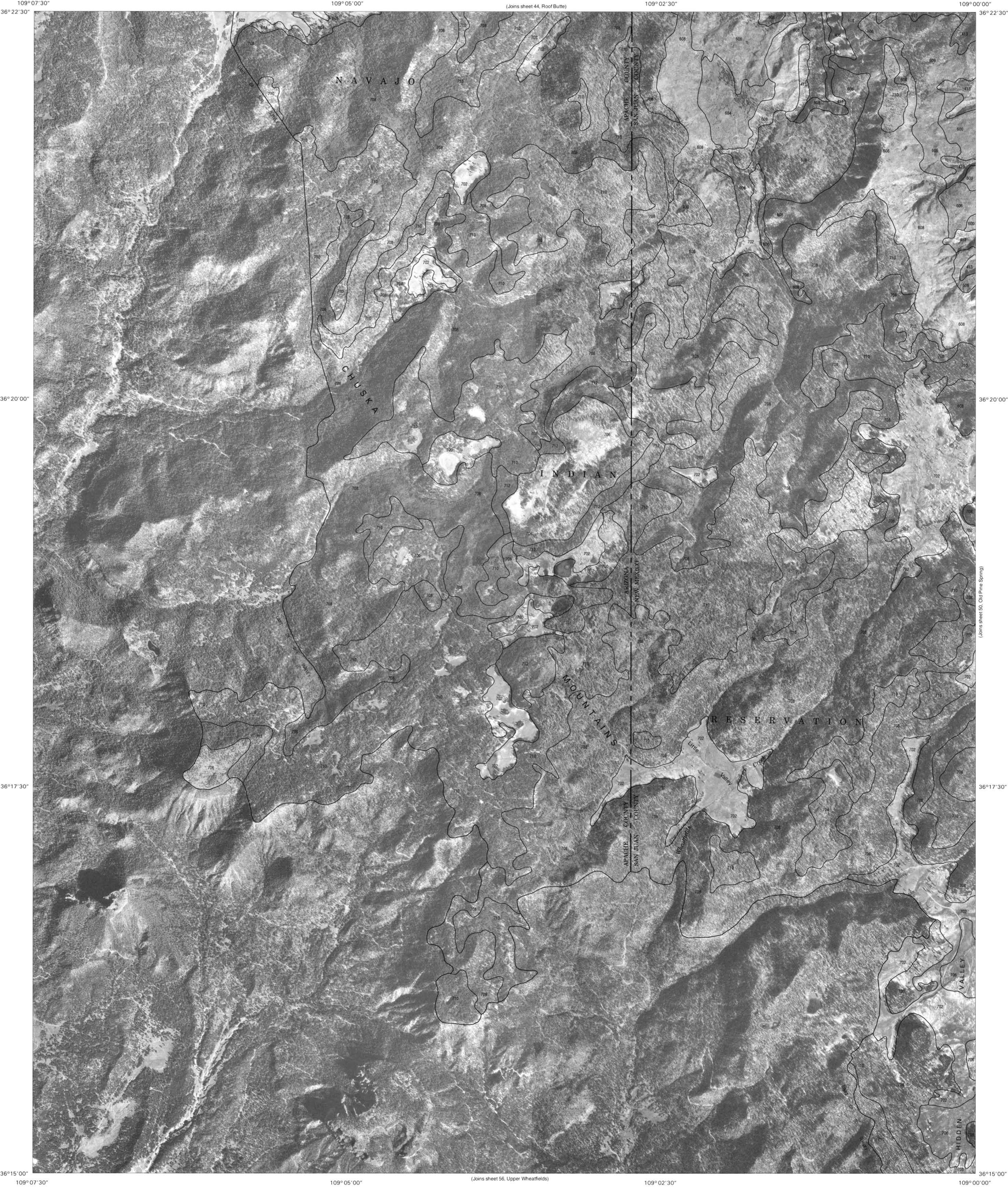
QUADRANGLE LOCATION

LITTLE WATER, NEW MEXICO
7.5 MINUTE SERIES
SHEET NUMBER 47 OF 65



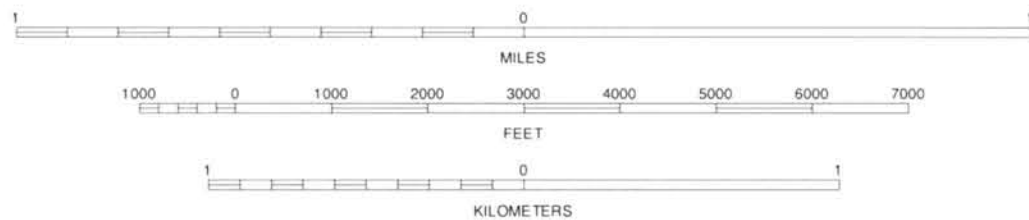
This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey, from 1952-1998 aerial photography. Public land survey system (PLSS) information was acquired from the Bureau of Land Management.

North American Datum of 1983 (NAD83). GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.



This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey, from 1992-1998 aerial photography. Public land survey system (PLSS) information was acquired from the Bureau of Land Management.

North American Datum of 1983 (NAD83), GRS-80 Spheroid 1000-meter ticks, Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.



SHIPROCK AREA, NM & AZ NO. 49

1	2	3
4	5	6
7	8	9

1 LUKACHUKAI
2 ROOF BUTTE
3 SANOSTEE WEST
4 TSAILE
5 OLD PINE SPRING
6 LOWER WHEATFIELDS
7 UPPER WHEATFIELDS
8 TOADLENA

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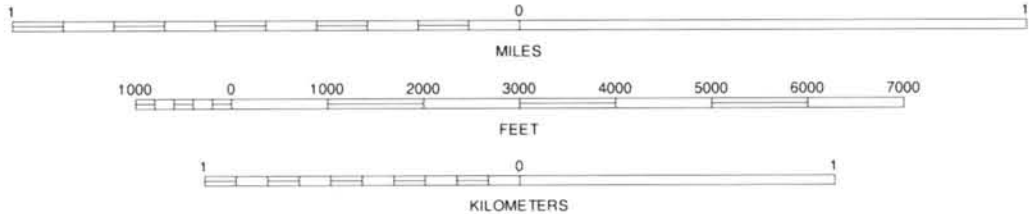
TSAILE BUTTE, ARIZONA
7.5 MINUTE SERIES
SHEET NUMBER 49 OF 65



This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey, from 1992-1998 aerial photography. Public land survey system (PLSS) information was acquired from the Bureau of Land Management.

North American Datum of 1983 (NAD83), GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH



SHIPROCK AREA, NM & AZ NO. 50

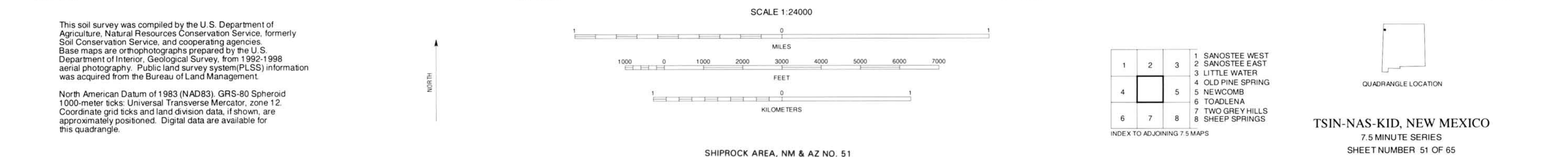
1	2	3	1 ROOF BUTTE
			2 SANOSTEE WEST
			3 SANOSTEE EAST
			4 TSAILE BUTTE
4		5	5 TSIN-NAS-KID
			6 UPPER WHEATFIELDS
			7 TOADLENA
6	7	8	8 TWO GREY HILLS

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QUADRANGLE LOCATION

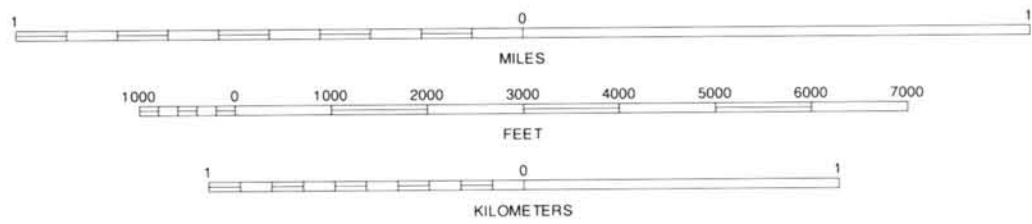
OLD PINE SPRING, NEW MEXICO
7.5 MINUTE SERIES
SHEET NUMBER 50 OF 65





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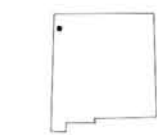
North American Datum of 1983 (NAD83). GRS-80 Spheroid 1000-meter ticks. Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.



SHIPROCK AREA, NM & AZ NO. 52

1	2	3	1 SANOSTEE EAST
			2 LITTLE WATER
			3 NEWCOMB NE
4		5	4 TSIN-NAS-KID
			5 NEWCOMB SE
			6 TWO GREY HILLS
			7 SHEEP SPRINGS
6	7	8	8 GREAT BEND

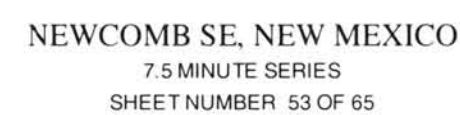
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QUADRANGLE LOCATION

NEWCOMB, NEW MEXICO
7.5 MINUTE SERIES
SHEET NUMBER 52 OF 65

SHIPROCK AREA, PARTS OF SAN JUAN COUNTY, NEW MEXICO AND APACHE COUNTY, ARIZONA
NEWCOMB SE QUADRANGLE
SHEET NUMBER 53 OF 65

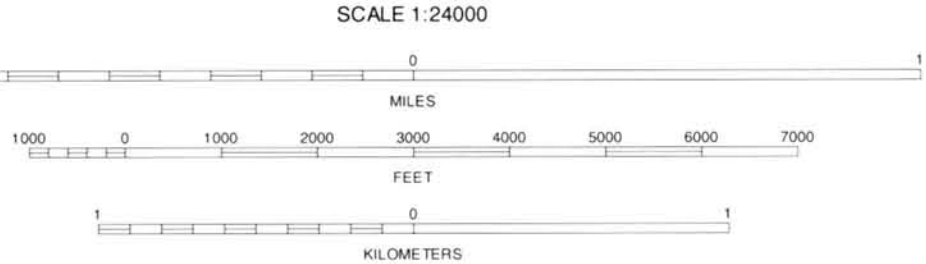




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North American Datum of 1983 (NAD83). GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH



SHIPROCK AREA, NM & AZ NO. 54

1	2	3	1 NEWCOMB NE
			2 THE PILLAR NW
			3 THE PILLAR
4		5	4 NEWCOMB SE
			5 BISTI TRADING POST
			6 GREAT BEND
6	7	8	7 EAST OF GREAT BEND
			8 HUNTER WASH

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QUADRANGLE LOCATION

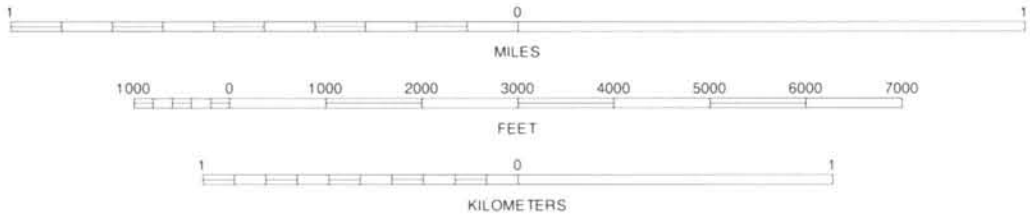
BURNHAM TRADING POST, NEW MEXICO
7.5 MINUTE SERIES
SHEET NUMBER 54 OF 65



This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey, from 1992-1998 aerial photography. Public land survey system (PLSS) information was acquired from the Bureau of Land Management.

North American Datum of 1983 (NAD83), GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH



SHIPROCK AREA, NM & AZ NO. 55

1	2	3	1 THE PILLAR NW
4	5	6	2 THE PILLAR
7	8	9	3 MONCISCO WASH
			4 BURNHAM TRADING POST
			5 ALAMO MESA WEST
			6 EAST OF GREAT BEND
			7 HUNTER WASH
			8 TANNER LAKE

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QUADRANGLE LOCATION

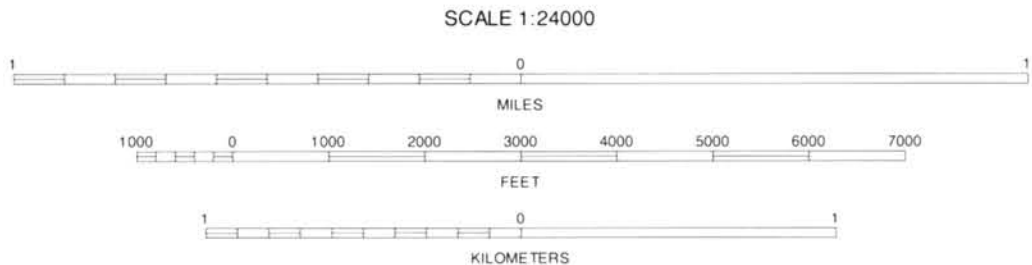
BISTI TRADING POST, NEW MEXICO
7.5 MINUTE SERIES
SHEET NUMBER 55 OF 65



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North American Datum of 1983 (NAD83). GRS-80 Spheroid. 1000-meter ticks: Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH



SHIPROCK AREA, NM & AZ NO. 56

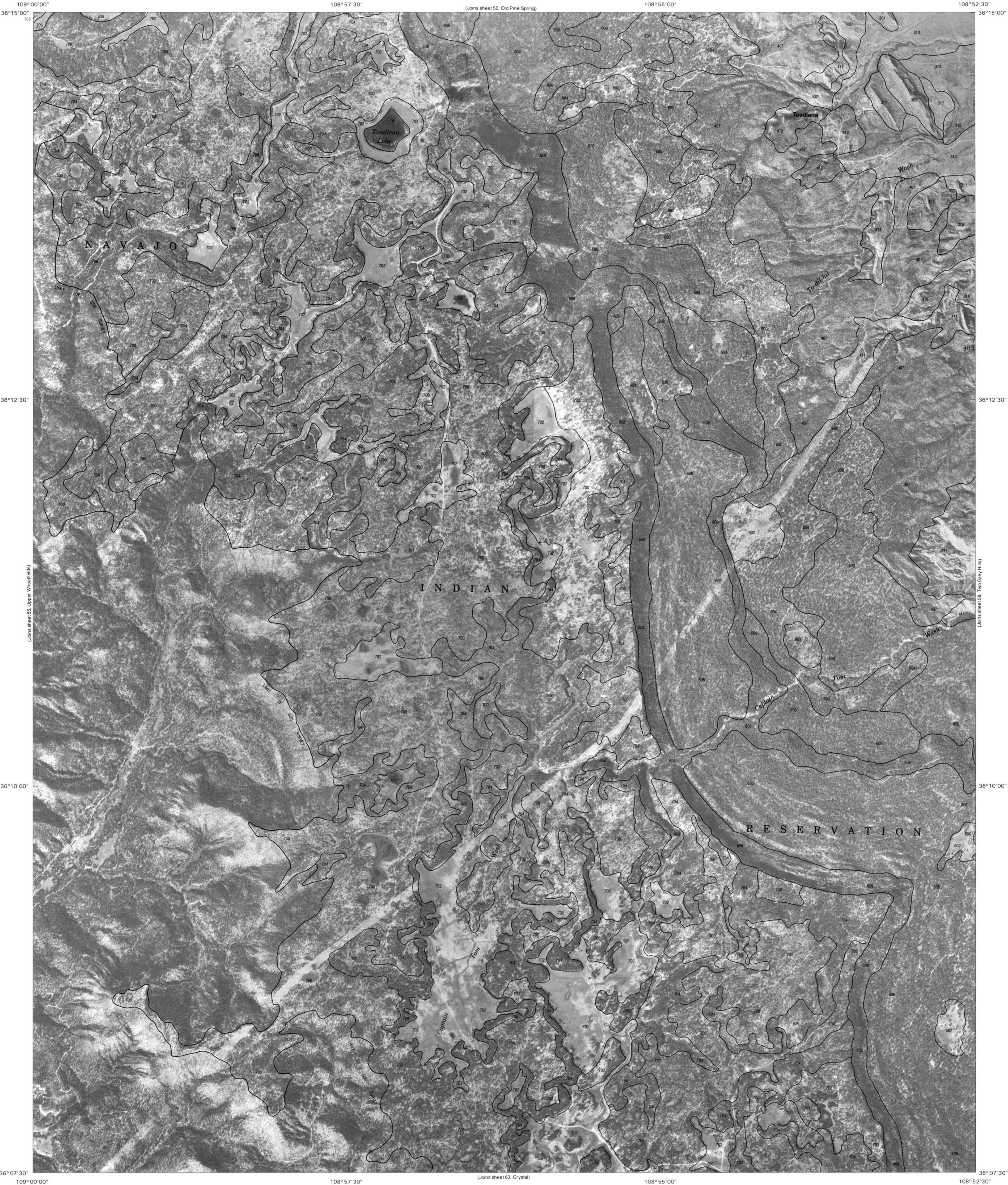
1	2	3	1 TSAILE
			2 TSAILE BUTTE
			3 OLD PINE SPRING
4		5	4 LOWER WHEATFIELDS
			5 TOADLENA
			6 WHITE CLAY
6	7	8	7 SONSELA BUTTES
			8 CRYSTAL

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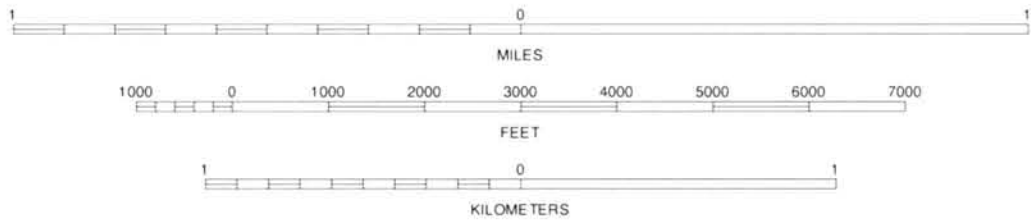
QUADRANGLE LOCATION

UPPER WHEATFIELDS, ARIZONA
7.5 MINUTE SERIES
SHEET NUMBER 56 OF 65



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North American Datum of 1983 (NAD83). GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.



SHIPROCK AREA, NM & AZ NO. 57

1	2	3	1 TSAILE BUTTE
4	5	2 OLD PINE SPRING	3 TSIN-NAS-KID
6	7	4 UPPER WHEATFIELDS	5 TWO GREY HILLS
		6 SONSELA BUTTES	7 CRYSTAL
		8 NARBONA PASS	



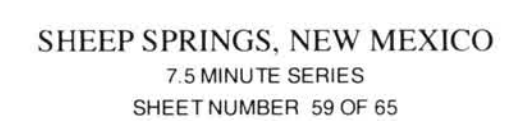
TOADLENA, NEW MEXICO
7.5 MINUTE SERIES
SHEET NUMBER 57 OF 65



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North American Datum of 1983 (NAD83), GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

SHIPROCK AREA, PARTS OF SAN JUAN COUNTY, NEW MEXICO AND APACHE COUNTY, ARIZONA
SHEEP SPRINGS QUADRANGLE
SHEET NUMBER 59 OF 65

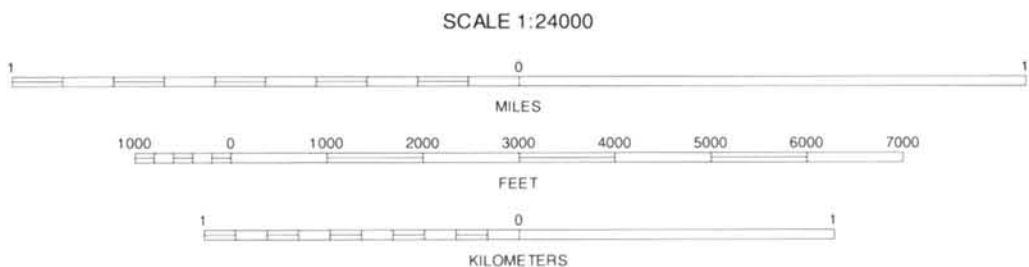




This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey, from 1992-1998 aerial photography. Public land survey system (PLSS) information was acquired from the Bureau of Land Management.

North American Datum of 1983 (NAD83), GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH



SHIPROCK AREA, NM & AZ NO. 60

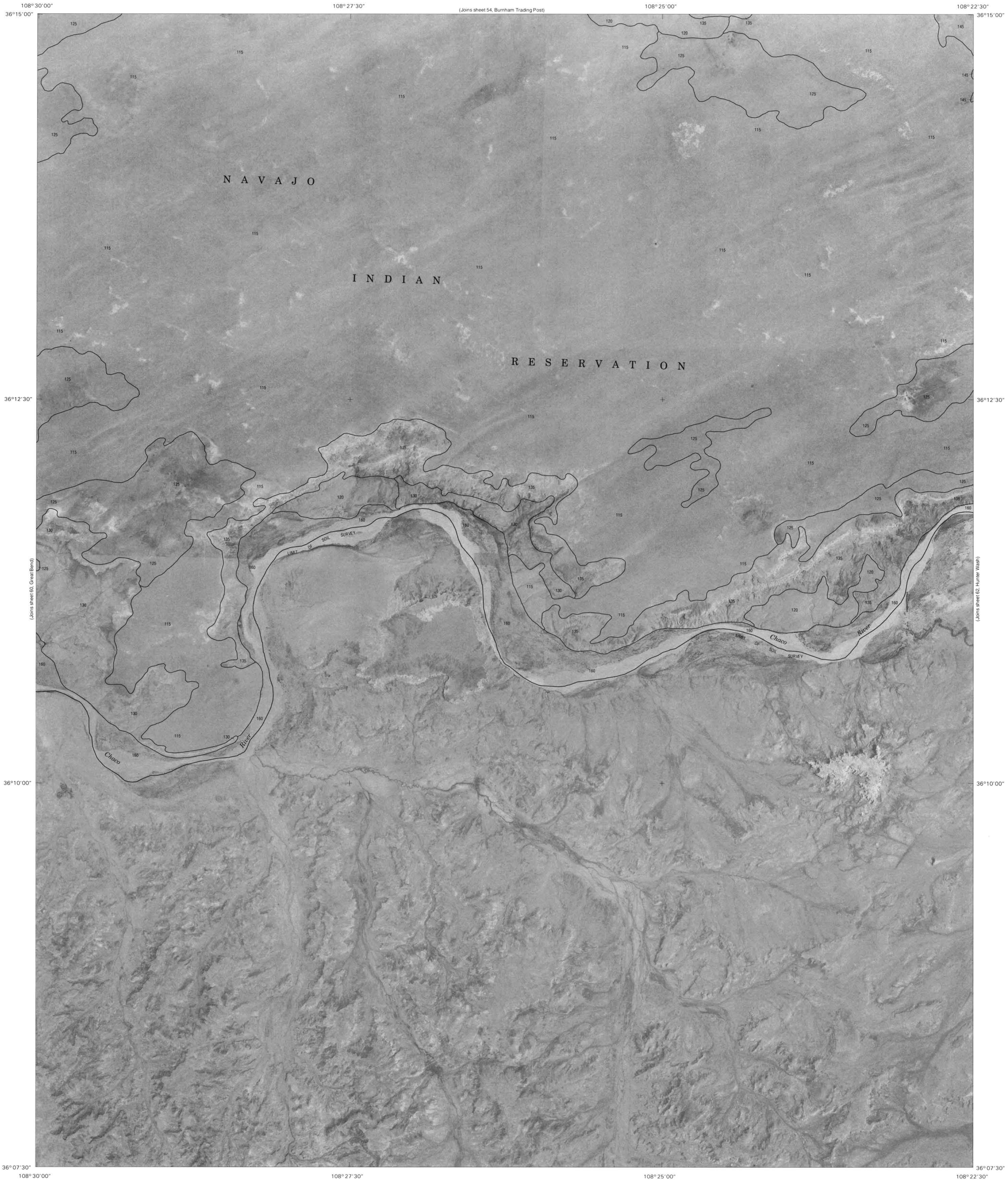
1	2	3	1 NEWCOMB
			2 NEWCOMB SE
			3 BURNHAM TRADING POST
4		5	4 SHEEP SPRINGS
			5 EAST OF GREAT BEND
			6 NASCHITTI
6	7	8	7 GREY HILL SPRING
			8 THE PILLAR 2 SW

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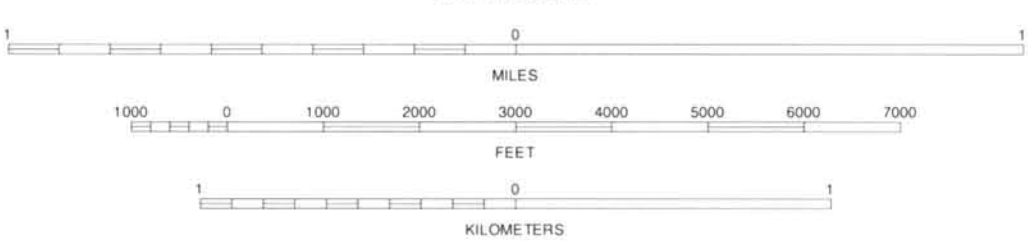
QUADRANGLE LOCATION

GREAT BEND, NEW MEXICO
7.5 MINUTE SERIES
SHEET NUMBER 60 OF 65



This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey, from 1992-1998 aerial photography. Public land survey system (PLSS) information was acquired from the Bureau of Land Management.

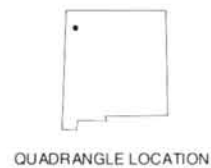
North American Datum of 1983 (NAD83). GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.



SHIPROCK AREA, NM & AZ NO. 61

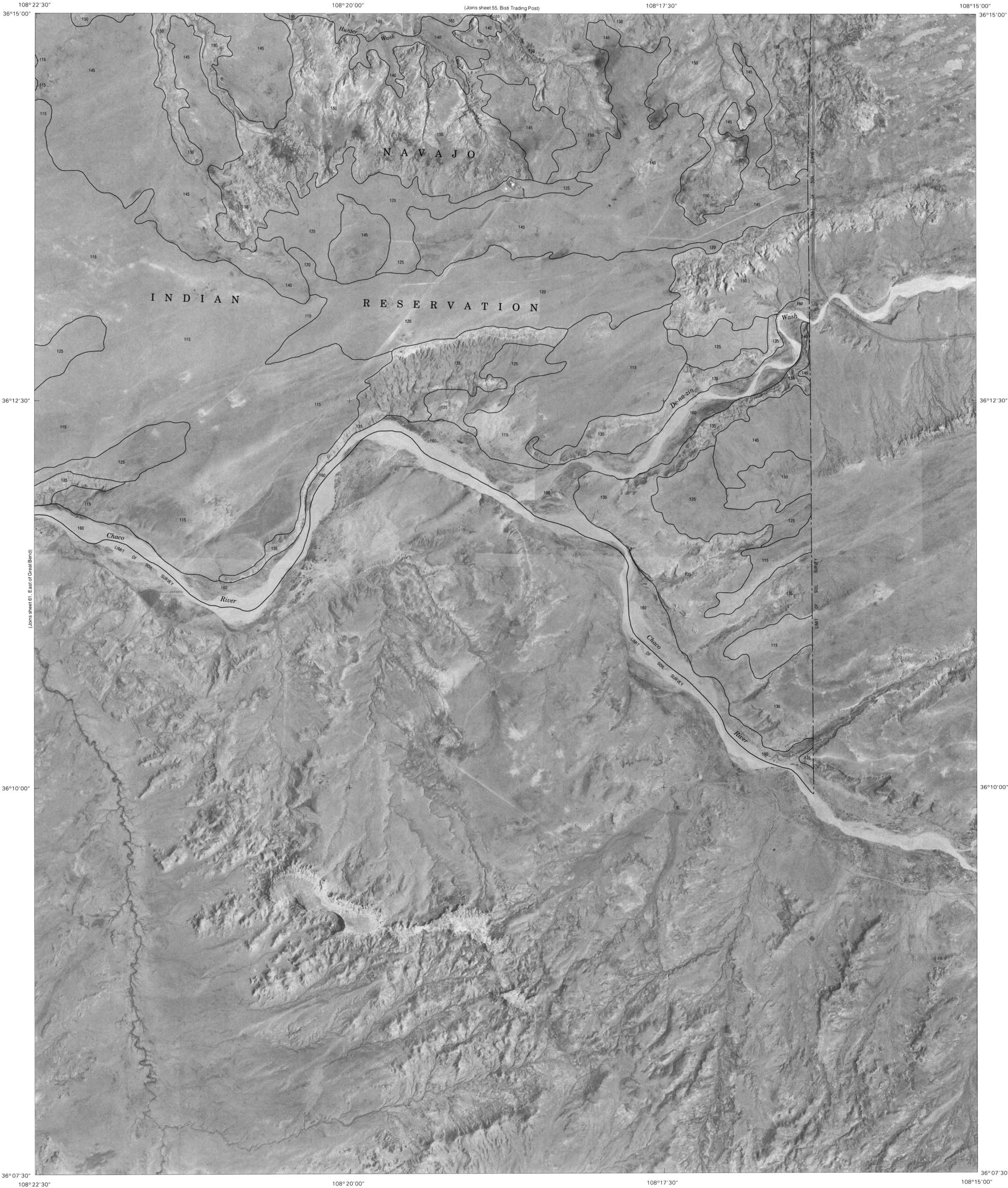
1	2	3	1 NEWCOMB SE
			2 BURNHAM TRADING POST
			3 BISTI TRADING POST
4		5	4 GREAT BEND
			5 HUNTER WASH
			6 GREYHILL SPRING
6	7	8	7 EAST OF GREYHILL SPRING
			8 WEST OF LA VIDA MISSION

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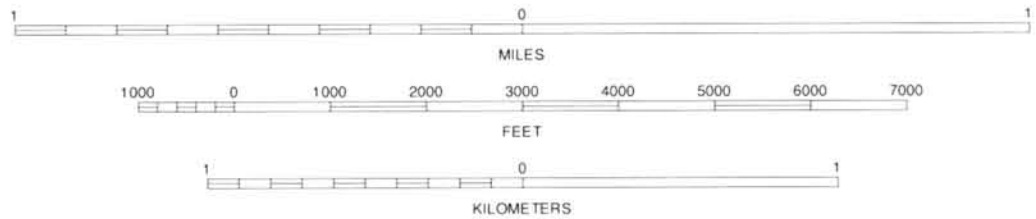
QUADRANGLE LOCATION

EAST OF GREAT BEND, NEW MEXICO
7.5 MINUTE SERIES
SHEET NUMBER 61 OF 65



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North American Datum of 1983 (NAD83), GRS-80 Spheroid 1000-meter ticks Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.



1	2	3	1 BURNHAM TRADING POST
4	5	2 BISTI TRADING POST	3 ALAMO MESA WEST
6	7	4 EAST OF GREAT BEND	5 TANNER LAKE
8		6 EAST OF GREY HILL SPRING	7 WEST OF LA VIDA MISSION
		8 LA VIDA MISSION	

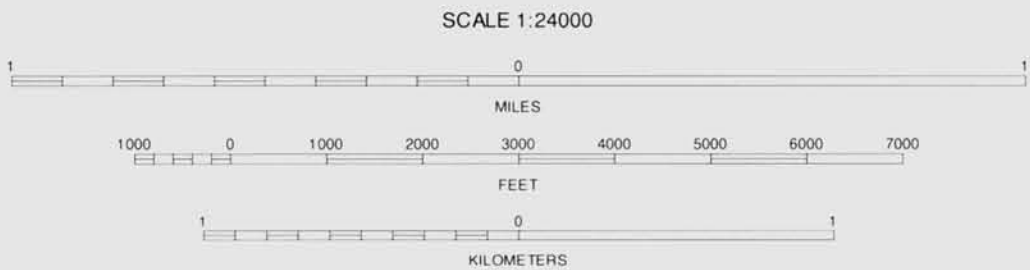




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North American Datum of 1983 (NAD83). GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

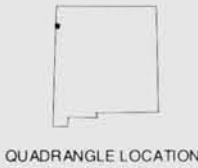
NORTH



SHIPROCK AREA, NM & AZ NO. 63

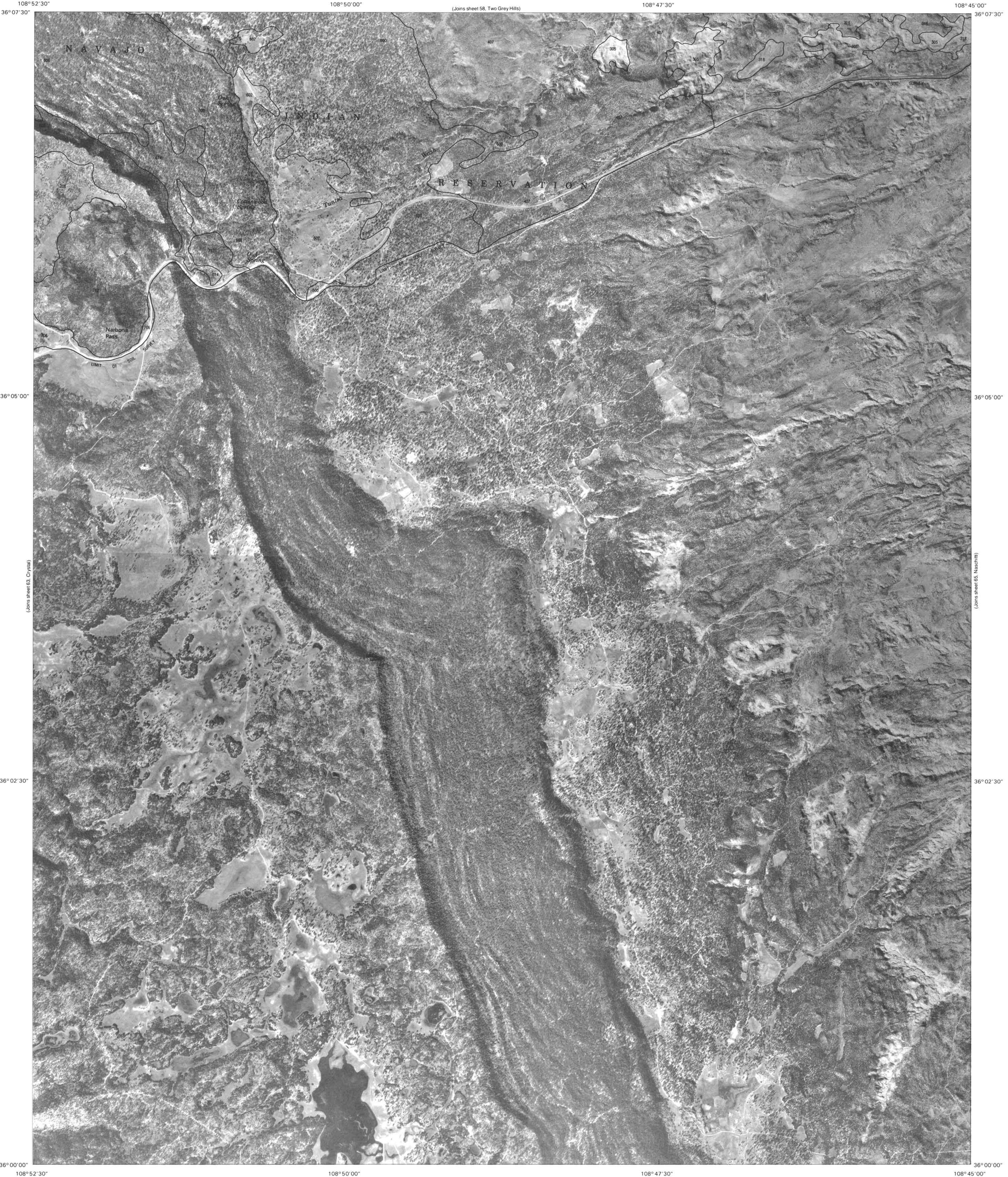
1	2	3	1 UPPER WHEATFIELDS
4	5	2 TOADLENA	3 TWO GREY HILLS
6	7	4 SONSELA BUTTES	5 NARBONA PASS
		6 BUELL PARK	7 TODD TO PARK
		8 CHUSKA PEAK	

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QUADRANGLE LOCATION

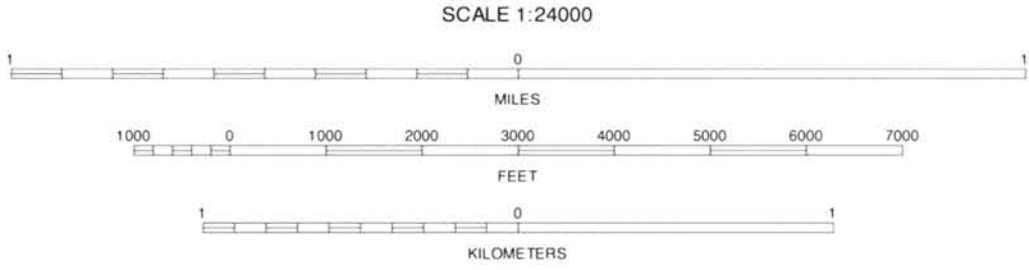
CRYSTAL, NEW MEXICO
7.5 MINUTE SERIES
SHEET NUMBER 63 OF 65



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North American Datum of 1983 (NAD83), GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 12. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH



SHIPROCK AREA, NM & AZ NO. 64

1	2	3	1 TOADLENA
			2 TWO GREY HILLS
4		5	3 SHEEP SPRINGS
			4 CRYSTAL
6	7	8	5 NASCHITTI
			6 TODILTO PARK
			7 CHUSKA PEAK
			8 COYOTE CANYON NW

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QUADRANGLE LOCATION

NARBONA PASS, NEW MEXICO
7.5 MINUTE SERIES
SHEET NUMBER 64 OF 65



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North American Datum of 1983 (NAD83), GRS-80 Spheroid 1000-meter ticks Universal Transverse Mercator, zone 12 Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

NORTH



1	2	3	1 TWO GREY HILLS
			2 SHEEP SPRINGS
			3 GREAT BEND
4		5	4 NARBONA PASS
			5 GREY HILL SPRING
			6 CHUSKA PEAK
6	7	8	7 COYOTE CANYON NW
			8 EAR ROCK

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QUADRANGLE LOCATION

NASCHITTI, NEW MEXICO
7.5 MINUTE SERIES
SHEET NUMBER 65 OF 65